

**Mobile phone text messaging language:
How and why undergraduates use textisms**

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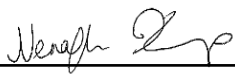
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Abstract

Mobile phone text messaging has continued to increase in popularity since its inception in 1992, but research into the language used in text messages has produced variable results. The overall purpose of this thesis was to investigate factors which might be associated with variations in textism use between individual phone users. In previous research, methodological variations between studies have made comparisons difficult and include the use of various message collection methods (e.g., asking participants to create messages versus to provide previously sent messages) and variations in the definition, categorisation and counting of altered words in text messages, or “textisms” (e.g., *2nite* for *tonight*, ☺). In Study 1 of this thesis, undergraduates (155 in Canada, 86 in Australia) were asked to provide text messages via three different collection methods. Messages that were translated and elicited under experimental conditions were found to contain more textisms than naturalistic messages copied from phones. Further, Australian participants used more contractive textisms (e.g., *fri* for *Friday*, *bday* for *birthday*) than Canadians, and more textisms overall. In Study 2, naturalistic data were collected from a further 386 Australian first-year undergraduates between 2009 and 2012. Over these time-points, textism use decreased, particularly for contractive textisms. Females used more expressive textism types (e.g., *pleeease!?!* for *please*) than males. Further differences in textism use were found to be related to the technology on participants’ phones and to participants’ attitudes towards textism use. In Study 3, the Australian and Canadian undergraduates from Study 1 completed a range of literacy and language tasks. The very few correlations between task scores and textism use that reached statistical significance were negative (students with higher linguistic scores used fewer textisms), although this relationship may have been influenced by differences in attitude and early literacy experience. In Study 4, the Australian students of Study 3 were able to discern situations in which textism use is

appropriate. Further, the examination of 303 written exams of a separate group of Australian undergraduates confirmed that textisms were avoided in these students' formal writing. In conclusion, individual textism use in messages is related to a number of factors, especially the technology on mobile phones. Rather than being associated with poor literacy skills, textism use can be conceptualised as a form of literacy skill that is adapted to the social expectations of undergraduates and the developing technology on phones to produce maximally efficient and expressive text-based communication.

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1

Introduction

Introduction

Mobile phones have become a part of everyday life, following a phenomenal growth in sales since the invention of the first handheld model in 1973 (Cooper et al., 1975; De Souza e Silva, 2006). In 2011, mobile phone subscriptions outnumbered people in 105 countries, with a total of nearly 6 billion subscriptions globally, averaging 86 subscriptions per hundred people worldwide (International Telecommunications Union, ITU, 2012). The twentieth anniversary of the first text message was celebrated in December, 2012, and from that first message, which simply said “Merry Christmas”, until now, texting has seen explosive growth. According to statistics released by Portio Research (2012), a trillion text messages were sent globally in one year for the first time in 2005, and 8.5 trillion messages were sent in 2012. The subsequent development of a text messaging ‘language’ during this rapid growth has afforded a unique opportunity to observe a rapidly forming and changing style of communication and to investigate the factors that influence its development.

The language that texters (the senders of text messages) use on their mobile phones has been referred to by a variety of terms in previous research, including “text speak” (Drouin & Davis, 2009), “textish” (Faulkner & Culwin, 2005), and “teen-talk” (Thurlow & Brown, 2003). In recent research, text language has also been referred to as “textese” (e.g., Drouin & Driver, 2012; Kemp, 2010), the term chosen for use in this thesis. The specific respellings, contractions, and additions to conventional English contained in text messages (e.g., *awsum* for *awesome*, *ppl* for *people*, and emoticons such as *:-p*) are referred to here as “textisms”, a term also used in previous research (e.g., Rosen, Chang, Erwin, Carrier, & Cheever, 2010; Wood, Jackson, Hart, Plester, & Wilde, 2011). Whereas the focus of this thesis is the examination of textese within text messages written in English, it should be

noted that the textisms studied are unique to neither text messaging nor to texting in English-speaking countries.

Text messaging language developed alongside other computer-mediated communication technologies, namely email and online chat (e.g., Instant Messenger). However, despite containing similar textisms to messages mediated by other communication technologies, text messages are unique in several ways. The synchronicity of text messages falls between the immediacy of an online chat conversation, and the convenience of an email, for which the recipient need not be ‘online’ to receive a message and for which an immediate response may not be expected. Unlike online chat conversations, text messages are stored on recipients’ phones, giving them a potential permanence similar to that of emails. In terms of formality, online chat, email, and text messages may all involve conversations between friends and family, but texts and online chat have traditionally been less likely than emails to serve as an avenue for formal business negotiations. When texting first became popular, it was the only of these technologies (texting, email, and online chat) that was phone-based and therefore entirely mobile, further bending texting conversations towards informal content, such as the coordination of meetings with peers, and reminders of errands yet to be completed.

More importantly, the creation of early text messages was restricted by the constraints of small mobile phone keypads, whereas online chat and emails were constructed via full QWERTY keyboards. Text-entry on early mobile phones was completed via alpha-numeric keypads on which letters appeared alongside the nine number keys (also called “T9” texting) and on which characters were selected via multiple key presses. Messages were limited to 160 characters per message, providing incentive for texters to minimise character use (Crystal, 2008; Hillebrand, 2010). Furthermore, the financial cost of early texting, which involved a charge for each message, was prohibitive

in comparison to data charges for otherwise free online chat services (e.g., Instant Messenger) and email accounts (e.g., Hotmail), leading texters to attempt to contain content within single short messages. It is plausible that all of these factors have combined in some way to shape uniquely the text messaging language that developed among texters. The resulting language norms contained in text messages provide an opportunity to investigate the characteristics of a unique and rapidly changing mode of communication, and the motivations associated with its use.

The timing of the research for this thesis occurred at a crucial juncture between the initial development of textese and the blurring of the lines that once separated text messaging from other forms of computer-mediated communication. Updated phone technology has been developed to overcome the restrictions of alpha-numeric keypads as well as to allow the internet to be accessed via mobile phones. Conversely, text messaging is now accessible via desktop and even mobile computers (e.g., Notebooks, iPads). Specific advances in mobile phone technology have included the addition of predictive software programmes to phones, overcoming the need for multiple key-presses to select any character as words are predicted based on programmed algorithms. Secondly, full keyboards and/or touchscreens now represent the most typical interface on more recent mobile phone models. Thirdly, the invention of ‘smartphones’ capable of internet connectivity (e.g., via ‘mobile broadband’) has allowed alternative forms of communication such as email to occur via mobile phones. The iPhone, first released in the US in 2007, included all of these new technologies, and by mid-2012, ownership of these and other smartphones was linked to more than 16 million internet subscriptions in Australia (Australian Communications and Media Authority, ACMA, 2012) and an approximated one billion mobile broadband subscriptions globally (ITU, 2012).

Other technological advances include MMS (Multimedia Service), allowing photos, videos and other material to be included in messages from phones, and more recently, OTT services (Over the Top services, such as WhatsApp and BBM, BlackBerry Messenger) where instant messages are sent from mobile phones and costs are covered by the user's internet connectivity plan. A reported drop in text messaging revenue of ten billion dollars in the US alone was ascribed to the release of OTTs in 2012, showing the dramatic effect newly available technologies can have on texters' choices in this rapidly changing market (Wireless Federation, 2012). The timing of the research for this thesis has been ideal, with data collection spanning from 2009, shortly after the introduction of the iPhone, to 2012, shortly after the introduction of OTTs. This has allowed a unique opportunity for an analysis of text messaging language that includes consideration of how changing technology may have affected textism use.

The development of textese may also have been affected by the demographic characteristics of its dominant users. From its genesis, text messaging language has largely been studied as a youth phenomenon and is associated with adolescent culture (e.g., Ling & Baron, 2007; Shortis, 2007; Thurlow & Brown, 2003). Large-scale reports show that texting is used predominantly by and between adolescents and young adults. Pew Internet surveys of Americans have shown that among adults, 18- to 24-year-olds sent and received the most texts ($M = 110$; Smith, 2011) and among teenagers, 14- to 17-year-olds sent and received more texts ($M = 181$) than 12- to 13-year-olds ($M = 122$; Lenhart, 2012). A recent Pew Internet survey of 12- to 17-year-old Americans found that 75% text-messaged friends several times a day, while only 24% text-messaged parents or guardians several times a day (Lenhart, Ling, Campbell, & Purcell, 2010). In a survey of 10- to 90-year-old Norwegians, 16- to 22-year-olds were found to both send and receive the most text messages (Ling, Bertel, & Sundsøy, 2012). Ling and colleagues calculated that same-aged

senders and recipients in this age group accounted for 60 times as many messages as would be expected if texting were spread evenly across all age groups. In a survey in Australia, where this thesis research is based, 18- to 24-year olds was the only age group who used text messaging more than any other communication technology (ACMA, 2012). Participation in texting and textism use has been ascribed social value as a marker of group identity among young people (Reid & Reid, 2004). Representations of youth accents (e.g., *gunna* for *going to*, *laterz* for *see you later*, and *bin* for *been*) have been observed as an important feature of textese (Thurlow & Brown, 2003; Shortis, 2007). Therefore, it is important to consider the textism use of adolescents and young adults, the key users, and even developers, of text messaging language.

The rapid uptake of new communication technologies by young people has resulted in an increasingly academic study of the resultant language forms. In 2001, Crystal called the development of ‘Netspeak’ (referring to computer-mediated communication in general) a “development of millennial significance”, noting that a “new medium of linguistic communication does not arrive very often, in the history of the race” (2001, pp. 238-9). Thurlow (2006) and Baron (2008) have concluded that the result has not been a new language as such, but rather a hybrid of written and spoken language. Crystal (2008) has since conceptualised textese as a form of writing pulled in the direction of speech. Frehner (2008) concluded that textese captures more communicative power than either conventional writing or speech, noting the expressive functions of some textisms (e.g., exclamatory spelling such as in *awww my darling*, and novel words such as the kiss *mmmwwahh*). These creative additions go beyond the efficiencies of character minimisation, and have also been viewed positively by others (e.g., Crystal, 2008; Thurlow & Brown, 2003).

In the early days of text messaging, news writers were less charitable about the appearance of textese, raising strongly worded concerns about the value of textism use and the dangers to conventional English it apparently presents. In 2006, Thurlow reviewed over 100 media reports from around the world regarding computer-mediated communication and found that reports were largely negative and alarmist. He concluded that the use of derogatory descriptions such as ‘cyber-slang’ and ‘technobabble’ reflected longstanding cultural fears of both new technology and youth culture. Two early media descriptions have endured in particular. In 2002, Sutherland described text language as “bleak, bald, sad shorthand”, a statement quoted so repetitively since then that Google’s search engine returned an estimated 33,700 hits for the phrase in a search completed personally on July 9, 2013. A similar search resulted in an estimated 54,000 hits for the first three lines of an extract from a 13-year-old Scottish girl’s school essay used to exemplify textese in formal writing and which begins “My smmr hols wr CWOT” (*My summer holidays were a complete waste of time*; BBC, 2003). The extraordinary over-use of these phrases underlines public interest in the nature and use of text language, and its effects on formal literacy.

Scientific research into textism use has been undertaken for a variety of purposes. Studies of text messaging language that fall outside the focus of this thesis include Event-Related Potential (ERP) studies, which have been completed to better understand how the brain processes textisms compared to standard spelling (e.g., Berger & Coch, 2010; Ganushchak, Krott, & Meyer, 2010), and computational linguistic studies of text messaging towards the improvement of mobile phone technology and the machine translation of textism-rich messages into other languages (e.g., Beaufort, Roekhaut, Cougnon, & Fairon, 2010; Choudhury, Saraf, Jain, Mukherjee, Sarkar, & Basu, 2007; Samanta, Achilleos, Moiron, Woods, & Ghanbari, 2009). Some researchers have

specifically investigated the nature of text language and types of textisms contained in messages (e.g., Frehner, 2008; Thurlow & Brown, 2003), and the relationship between textism use and conventional literacy skills (e.g., Kemp & Bushnell, 2011; Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton, 2011). These will be considered in more detail below.

Linguists from many countries have studied text messaging language in terms of textism use and factors associated with its use (see Thurlow & Poff, 2012, in press, for a review). Textism types are constructed in similar ways across several languages. For example, Herring and Zelenkauskaitė (2009) observed unconventional spellings and abbreviations in Italian texts such as *t* for *ti*, *ke* for *che*, and *nn* for *non*, similar to textisms observed by Yvon (2010) in French texts such as *c* for *c'est*, *kon* for *qu'on*, and *pr* for *pour*, and the English textisms *b* for *be*, *sum* for *some*, and *cn* for *can*. Similarly, textism respellings of conventional Spanish include *sl2* for *saludos* (Alonso & Perea, 2008) and in French, *2* for *de* (Anis, 2007), mirroring the phonetic equivalent of *two* in each language as in the English *2* for *to* in *2day*. Other languages include textism variations inherent to the language themselves. For example, as noted by Tseliga (2007), non-English letters in Greek may be represented by Roman letters or numbers (referred to as 'orthographic transliteration') such as *A8hva* for *Aθηνα* (*Athens*). Plester and colleagues (2011) note that conventional written Finnish contains contractions that spoken Finnish does not, so that these are seen as more expected and acceptable than contractions in written English. Therefore, we have largely restricted our careful consideration of text messaging studies to those of text messages written in English.

Methodological issues

Published studies of text messaging language began to appear in the early 2000s (e.g., Androutsopoulos & Schmidt, 2002; Brown, 2002; Grinter & Eldridge, 2003). A

number of methodologies have emerged in this new and developing area of research, not all of which involve the collection of text messages from individuals. Some researchers have studied textism use by accessing large, anonymous corpora of text messages (e.g., in computational linguistic analyses: Choudhury et al., 2007; in a functional analysis of symbols and message content: Beasley, 2009; and even in the analysis of “gendered typography”: Herring & Zelenkauskaitė, 2008, 2009, where usernames and content were used to identify gender). Others have gathered estimates of textism use through survey questions (e.g., in studies of the relationship between self-reported textism use and literacy: Drouin, 2011; Massengill Shaw, Carlson, & Waxman, 2007), a method which may limit the validity of participants’ responses.

Methodological variation in message collection. In studies involving the active collection of text messages from individual participants, researchers have used several different methodologies for message collection. One experimental method of message collection is the translation of words and messages from Standard English into textese (e.g., Drouin & Davis, 2009; Neville, 2003). In some studies using translation tasks (e.g., Kemp, 2010; De Jonge & Kemp, 2012), messages were designed to include words that had appeared frequently in messages collected previously by the same researchers. There are two advantages of translation-based methods: the increased comparability of messages between participants (as the range of possible textisms is limited), and the fact that words of particular interest can be targeted. However, the proportion of textisms contained in these messages may be inflated due to the intentional inclusion of high numbers of words that are easily abbreviated. Therefore textism use in experimental messages may not accurately represent natural use by participants in the real world.

Other message collection methods have been designed to capture more realistic examples of textism use. One such method involves asking participants to write a message

in response to a specified situation. This scenario-based message elicitation method was employed by Plester, Wood, and Joshi (2009) because children were not permitted to use their phones at school. This is also a method that avoids potential ethical and financial issues involved in asking children to send messages to a researcher's phone. However, it may also lead to overestimates of textism use.

Whether messages are translated from Standard English or written in response to scenarios, the nature of experimental tasks, and instructions given to explain/introduce them, may affect results by altering participants' perceptions of researcher expectations. For example, instructions designed to elicit textism use in translation tasks have included: "Please translate the following sentence from Standard English into text speak (e.g., from 'better' to 'btr')" (Drouin & Davis, 2009, p. 53), and "write using text-messaging abbreviations such as *u* for *you* and *2* for *to*." (Kemp, 2010, p. 58). Participants may have been inadvertently encouraged to try to think of textisms to match as many words as possible, rather than to attempt an accurate representation of their overall textism use, and therefore overestimate their textism use.

To overcome the difficulties of collecting realistic messages from experimental tasks, naturalistic collection methods have also been used. In some cases, participants have been asked to copy messages sent (and sometimes received) from their phones (e.g., Bodomo, 2010; Drouin & Driver, 2012; Ling & Baron, 2007). However, variation exists even in studies involving messages copied from phones. In one study, participants filled out text messaging diaries for two weeks (Faulkner & Culwin, 2005), and in another, messages were collected from participants' iPhones over a period of six months via an installed data-collection software application (Tossell, Kortum, Shepard, Barg-Walkow, Rahmati, & Zhong, 2012). Where naturalistic messages are collected after participation in a text language study has been established, it is possible that data might also show higher

rates of textisms than in messages present on phones prior to the research if participants believe textism use is expected by the researcher.

No previous study appears to have directly investigated how variations in collection methods may affect the nature of the language used in texts. By comparing multiple results from tasks designed to examine the extent and characteristics of textism use, it seems that there may be an effect of message collection method. This potential effect is particularly noticeable in terms of reported textism densities (which are calculated by dividing the number of textisms in messages by the number of all words in the messages). Specifically, it may be that experimental methods lead participants to over-represent their textism use. In separate studies of 10- to 12-year-olds' text messages, the density of textisms compared to total words was found to be 57-59% in translated messages (Plester, Wood, & Bell, 2008) and only 34% in scenario-based messages (Plester et al., 2009). Messages translated into textese by university students contained 14% textisms in one study (De Jonge & Kemp, 2012), and 43-57% in another (Kemp, 2010). Naturalistic messages have generally contained the lowest textism proportions, with 16% observed textisms in 9- to 10-year-olds' messages (Wood, Jackson, Hart, Plester, & Wilde, 2011), and from 5% (Ling & Baron, 2007) to 28% (Drouin & Driver, 2012) in adults' messages. It is difficult to interpret these differences in light of variation in the age and phone experience of participants, but nonetheless it is clear that formal investigation into the effect of collection method on textism use is vital to interpret results and inform future research.

Methodological variation: Textism categorisation and counting. Once messages have been collected, message length (average words per message) may be calculated and textisms identified and categorised into textism types. As with message collection, categorisation and counting methods have been inconsistent across studies. Questions have

arisen over which words are counted as textisms, the names and definitions of categories, and the categories in which specific textisms belong.

Textisms are similar to word-forms that predate mobile phones, and are accepted beyond the context of text messages, which adds complexity to decisions about which words to count as textisms within messages. Some words commonly considered as textisms in current research first appeared in literature more than one hundred years ago (e.g., *wiv* for *with*, *gonna* for *going to*, see Crystal, 2008; Shortis, 2007). The shortening of words, such as writing *Mon* for *Monday*, has also existed long before text messaging. The text engraved above The Pantheon in Rome is written, “M.AGRIPPA.L.F.COS.TERTIUM.FECIT”, in which four of the seven words are abbreviated in some way compared to the full version, “MARCUS AGRIPPA, LUCII FILIUS, CONSUL TERTIUM, FECIT” (translated “Marcus Agrippa, son of Lucius, on his third consulship, built [this temple]”; Kentucky Educational Television, 2013). Another historic textism appears in a letter from Lord Fisher to Sir Winston Churchill, dated September 9th, 1917. The letter concludes, “... I hear that a new order of Knighthood is on the tapis –O.M.G. (Oh! My God!)-Shower it on the Admiralty!!” (Locker, 2012, p. 1). Interestingly, *OMG* and *LOL* (laugh out loud) have recently been recognised as a part of modern English, as evidenced by their addition to the Oxford English Dictionary (OED, 2011). Textisms have also appeared in advertising and food-products. For example, an Australian advertisement outside several corner stores claims, “ICE CREAM MAKES U HAPPY”, and a range of carbonated fruit juice, called *LOL*, includes the flavours, “RAZZ BRI” and “U DA MAN”. Textisms have even crossed from written forms into verbal speech (e.g., “lols” and the verbal equivalent of the graphic textism ☹, “sad face!”; heard in personal conversations with university students).

Many published papers include examples of textisms within the textism categories used to analyse messages, but these show wide variation between studies. For example, some researchers have counted traditional acronyms (e.g., *UK* for *United Kingdom*; Plester et al., 2009) and spelling errors (e.g., *excelent* for *excellent*; Thurlow & Brown, 2003), whereas others have not. Category names for words such as *gonna* for *going to* include ‘accent stylisation’ (Thurlow & Brown, 2003), ‘accent simulation’ (Shortis, 2007), and ‘youth code’ (Plester et al., 2008). Varying category definitions have resulted in the textism *u* for *you* has been categorised within ‘abbreviations’ (Ling & Baron, 2007), ‘shortenings’ (Rosen, Chang, Erwin, Carrier, & Cheever, 2010), and ‘letter/number homophones’ (Thurlow & Brown, 2003). The categorisation schemes presented in key studies of text messages from English-speaking countries are summarised in Table 1 to provide a full comparison of categorisation options for future researchers. Fewer than half of the papers highlighted in Table 1 were published prior to the commencement of the current research, but the categories used in the following chapters are similar to recent published categorisations. Categories are sorted into ‘contractive’, ‘expressive’, and ‘other’ textism types as explained further in the following chapters. In brief, contractive textisms involve character deletions (e.g., the homophone *r* for *are*), while expressive textisms involve the addition of extra characters (e.g., *hooooome* for *home*). Other textism types include spelling errors, typos, and textism categories in which at least some of the words do not change in length (e.g., unconventional spelling such as *thankx* for *thanks*) or exist in any other form (e.g., the youth stylisations *gah* to express frustration and *whoop whoop* to express joy) (see Table 1).

Most of the categorisation schemes shown in Table 1 include references to shortenings, contractions, homophones, and youth stylisations, although variations in names and category definitions clearly persist. Several key studies were excluded from

Table 1 as textism categorisation was either not performed, or was not clear from the published texts. For example, Massengill Shaw et al. (2007) referred to textisms overall as ‘Abbreviations’, but analysed each textism individually without categorising types. Wood, Meacham et al. (2011) reported only that they used those specified in Plester et al. (2009). Drouin (2011), Kemp and Bushnell (2011), and Wood, Jackson et al. (2011) do not report textism analyses by category. Tossell et al. (2012) only analysed emoticon use in messages. Shortis (2007) proposed categories similar to those above, as well as several unique textism categories: colour/movement/pictorial imagery, eye dialect (e.g., *tuff* for *tough*), stage directions (e.g., *Monsieur (said in a French accent)*), and special effects such as writing in *webdings* font (so that message is only understood when converted to an alphabetic font).

Some categorisation variations affect textism density results, while others do not. For example, the varied categorisation of *u* for *you* as a letter homophone (e.g., Neville, 2003), an abbreviation (Ling & Baron, 2007), or an omission of non-essential letters (Cingel & Sundar, 2012) does not affect the calculation of overall textism density, because it is still counted as only one textism. However, the inclusion of textism categories such as spelling errors, traditional acronyms and omitted capitalisation in some studies would inflate estimates of textism use for these studies compared to studies that exclude these transformation types from textism counts. Furthermore, some textisms can be included in more than one category (e.g., *im* for *I’m*, in which capitalisation and an apostrophe have been omitted), and such textisms have been counted in more than one category by some researchers (e.g., De Jonge & Kemp, 2012; Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong, 2009).

Table 1

Categories and Textism Examples Listed in Selected Studies of Language in Text Messages (all studies were of text messages written in English).

	Grinter & Eldridge, 2003	Thurlow & Brown, 2003	Neville, 2003	Bieswanger, 2007
Categories for Contractive Textism Types	Abbreviations: Ad-hoc (<i>spose: suppose</i>) Abbreviations: Known (<i>mins</i>) Dropping Single Letter (<i>ritten: written</i>) Sounds: Letters (<i>fone: phone</i>) Sounds: Symbols (<i>th@s: that's</i>) Sounds: Numbers (<i>gr8: great</i>) Acronyms: Separate Words (<i>PWB: please write back</i>) Acronyms: Single Word (<i>w: with</i>) Acronyms Compound Word (<i>gf: girlfriend</i>) Foreign Short Forms (<i>bs: besos</i>)	Shortenings (<i>Uni: University</i>) Contractions (<i>nt: night</i>) G Clippings (<i>goin: going</i>) Other Clippings (<i>hav: have</i>) Acronyms (<i>DI: Detective Inspector</i>) Initialisms (<i>V: Very</i>) Letter/Number Homophones (<i>B: be</i>) Non-conventional Spellings (<i>fone: phone</i>) Accent Stylisation (<i>de: the</i>) Typographic Symbols (!!) Emoticons (:->)	Letter & Number Homophones (<i>u: you</i>) Abbreviations (<i>ppl: people</i>) Spoken Slang Shortenings (<i>soz: sorry</i>) Dropped Vowels (<i>hppn: happen</i>) Phonetic Abbreviation (<i>sed: said</i>) Downward Converging Accent Feature Simulation (<i>wanna: want to</i>) Substitution of Hard 'th' Sounds: 'd's (<i>dat: that</i>) Symbols (<i>congr@ulate: congratulate</i>) Initialisms (<i>SYL: see you later</i>) Misspellings	Initialisms (<i>NY: New York</i>) Clippings (<i>bday: birthday</i>) Contractions (<i>don't: do not</i>) Letter-/Number-Homophones (<i>b: be</i>) Phonetic Spellings (<i>bin: been</i>) Word-Value Characters (<i>x: kiss</i>)
Categories for Expressive Textism Types				
Categories for Other and Mixed Textism Types	Hybrid: Using two or more of the above (<i>b4: before</i>) Foreign Letters (<i>ü: :-)</i>)	Misspellings and Typos (<i>excelent: excellent</i>)	Misspellings	

Table 1 continued ...

	Ling & Baron, 2007	Frehner, 2008	Plester et al., 2008	Drouin & Davis, 2009
Categories for	Acronyms (<i>lol: laughing out</i>	Letter and Number Homophones	Rebus, or Letter/Number	Initialisms (<i>ttyl: talk to you later</i>)
Contractive Textism	<i>loud</i>)	(<i>r: are</i>)	Homophones (<i>C U L8R: see you</i>	Letter/Number Homophones
Types	Abbreviations (<i>U: you</i>)	Clippings (<i>jus: just</i>)	<i>later</i>)	(<i>c: see</i>)
	Vowel Deletions (<i>b: be</i>)	Consonant Spelling (<i>mst: must</i>)	Other Phonological Reductions	Shortenings (<i>ur: you're</i>)
	Miscellaneous Lexical	Apostrophes (<i>evans: Evan's</i>)	(<i>nite: night</i>)	
	Shortenings (<i>Sun: Sunday</i>)	Phonological Approximation and	Symbols (&: <i>and</i>)	
	Contractions (<i>can't: cannot</i>)	Other Non-Standard Shortenings	Acronyms (<i>WUU2: what you up</i>	
		(<i>dis: this</i>)	<i>to</i>)	
			Youth Code (<i>hafta: have to</i>)	
Categories for	Emoticons (<i>smileys</i>)	Emulated Prosody and		
Expressive Textism		Onomatopoeic Exclamatory		
Types		Spelling (<i>looove: love</i>)		
		Emoticons (*8-)) [<i>analysed</i>		
		<i>separately</i>]		
Categories for		Misspellings [<i>analysed</i>		
Other and Mixed		<i>separately</i>]		
Textism Types		Capitalisation [<i>analysed</i>		
		<i>separately</i>]		
		Punctuation [<i>analysed</i>		
		<i>separately</i>]		

Table 1 continued ...

	Plester et al., 2009	Tagg, 2009	Kemp, 2010	Rosen et al., 2010
Categories for	Shortenings (<i>tues</i>)	<i>[several detailed linguistic</i>	Initialisms (<i>brt: be right there</i>)	Linguistic Textisms:
Contractive Textism	Contractions (<i>hmwrk</i>)	<i>analyses were used, organised by</i>	Letter Homophones (<i>BN: being</i>)	Acronyms (<i>LOL, L8R</i>)
Types	G-clippings (<i>swimmin</i>)	<i>transformation (e.g., Final</i>	Contractions (<i>tim: time</i>)	Lowercase “i” in place of
	Other Clippings (<i>hav</i>)	<i>Syllable Omission), by spelling</i>	Number Homophones (<i>aQr8:</i>	uppercase I as a personal
	Omitted Apostrophes (<i>dads</i>)	<i>variation function (e.g.,</i>	<i>accurate)</i>	pronoun
	Acronyms (<i>BBC</i>)	<i>Regiolectal Respelling, such as</i>	Phonological Spelling (<i>parz:</i>	Removing apostrophes from
	Initialisms (<i>lol</i>)	<i>summort: something), and by</i>	<i>parents)</i>	contractions (<i>dont: don’t</i>)
	Symbols (<i>@</i>)	<i>spelling variation form (e.g.,</i>	Capitalisation Drop (<i>i: I</i>)	Shortening words (<i>tht: that</i>)
	Letter/number Homophones (<i>2moro</i>)	<i>Colloquial Respelling, such as</i> <i>dd: tt in liddle: little)]</i>		
Categories for	(Symbols also included		<i>[the examples listed here were</i>	Contextual Textisms:
Expressive Textism	emoticons (<i>:-o</i>))		<i>taken from a table that did not</i>	Inserting emoticons or smilies
Types			<i>necessarily include all categories</i> <i>used]</i>	(☺)
				Using special characters to
				denote emotional states (<i>::hug::</i>)
				Using all capital letters to denote
				strong emotions (<i>I AM ANGRY</i>)
Categories for	Non-conventional Spellings		Accent Stylisation (<i>d: the</i>)	
Other and Mixed	(<i>fone</i>)		Slang Abbreviation (<i>parz:</i>	
Textism Types	Accent Atylization (<i>anuva</i>)		<i>parents)</i>	
	Misspellings (<i>comming</i>)			

Table 1 continued ...

	Bushnell et al., 2011	Coe & Oakhill, 2011	Durkin et al., 2011	Holtgraves, 2011
Categories for	Letter-Number Homophones	Letter/Number Homophones	Non-traditional Abbreviations	Slang (<i>dunno</i>)
Contractive Textism	(<i>l8: late</i>)	G Clippings	Homophones	Acronym (<i>LOL</i>)
Types	Contractions (<i>bday: birthday</i>)	Other Clippings	Letter Drop	G drop (<i>doin</i>)
	Omitted Apostrophes (<i>cant: can 't</i>)	Shortenings	Acronyms	Number for Sound (<i>L8</i>)
		Contractions		Letter Omission (<i>R: are</i>)
		Symbol	[<i>Textism examples were not included, but categories were based on those in Grinter & Eldridge, 2003, and Plester et al., 2009</i>]	Abbreviations (<i>x: kiss</i>)
		Initialisms		Combined Words (<i>nevermind</i>)
		[<i>Textism examples were not included, but categories were based on those in Thurlow & Brown, 2003</i>]		
Categories for				Expansions (<i>bitchhhhhhhhhhh</i>)
Expressive Textism				Emoticons
Types				
Categories for	Accent Stylisations (<i>people: peeps</i>)	Accent Stylisations	Youth Code	
Other and Mixed		Non-Conventional Spellings		
Textism Types	Non-conventional Spellings (<i>skool: school</i>)			

Table 1 continued ...

	Veater et al., 2011	Cingel & Sundar, 2012	De Jonge & Kemp, 2012	Drouin & Driver, 2012
Categories for	Shortenings	Word Adaptations:	Shortening/Other Clipping	Shortening/Other Clipping (<i>def</i>)
Contractive Textism	Contractions	Abbreviations or Initialisms (<i>lol</i> ,	(<i>xcellent</i>)	Contraction (<i>sry</i>)
Types	G clippings	<i>btw</i>)	Contraction (<i>tmrw</i>)	g-clipping (<i>talkin</i>)
	Other Clippings	Omission of Non-essential	g-clipping (<i>studyin</i>)	Omitted Apostrophe (<i>cant</i>)
	Symbols	Letters (<i>wud</i> , <i>u</i>)	Omitted Apostrophe (<i>Kates</i>)	Initialism (<i>ttyl</i>)
	Initialisms	Substitution of Homophones	Initialism (<i>btw</i>)	Combined Letter/Number
	Homophones	(<i>be4</i>)	Combined Letter/Number	Homophone (<i>ur</i>)
	Missing Apostrophe		Homophone (<i>w8</i>)	Single Letter/Number
			Single Letter/Number	Homophone (<i>y</i> , <i>u</i>)
			Homophone (<i>u</i> , 2)	
	[Textism examples were not included, but categories were based on those in Plester et al., 2009]			
Categories for			Symbol (:), <i>x</i>)	Symbol (:))
Expressive Textism				
Types				
Categories for	Non-conventional Spellings	Structural Adaptations:	Spelling Error (<i>ansxer</i>)	Spelling Error (<i>htat's</i>)
Other and Mixed	Accent Stylisation	Punctuation Adaptations	Nonstandard Spelling (<i>neva</i>)	Nonstandard Spelling (<i>xcitd</i>)
Textism Types		Capitalisation Adaptations	Accent Stylisation (<i>arvo</i>)	Accent Stylisation (<i>didja</i>)
			Omitted capitalisation (<i>i</i> , <i>oliver</i>)	Omitted capitalisation (<i>i</i> , <i>facebook</i>)

Alternatively, in some studies textisms have only been counted once, with categorisation then based on the first transformation in the word (so only the omitted capital would be counted in *im* for *I'm*, e.g., Plester et al., 2009), leading to lower textism densities than if all transformations had been counted. Finally, small differences in textism density data may also result from comparing textisms averaged across the full corpus with textism densities calculated for individual messages or participants before averaging across the full sample (see Drouin & Driver, 2012). Therefore researchers need to take into account textism counting and categorisation variations when interpreting results.

Fine-grained categorisations such as the schemes in Table 1 allow for comparisons between specific textism types and literacy scores or participant demographics, but it is also useful to consider larger-grained categorisations of textism types. Broader categorisations of textisms have simplified textism types in several ways, including ‘deletions’ versus ‘insertions’ based on a comparison between the number of characters in the textism compare to conventional spelling (Herring & Zelenkauskaitė, 2009) and ‘linguistic’ versus ‘contextual’ textisms, where contextual textisms are those that add emotional content to the message (e.g., *::hug::*, Rosen et al., 2010). Other researchers have included further analyses of text language such as of participants’ use of conventional punctuation in text messages (Frehner, 2008; Ling & Baron, 2007) and the ways in which phonemes and other letter combinations are typically respelled in textism transformations (Frehner, 2008; Tagg, 2009). An awareness of the methodological differences between studies is of benefit to readers and designers of future research alike.

Factors associated with variations in textism use

Whereas methodological issues make comparisons between studies difficult, even studies utilising similar collection methods have produced varied results. For example, when 10- to 12-year olds translated messages into textese, the resulting texts contained

from 24% to 59% textisms (Kemp & Bushnell, 2001; Plester et al., 2008). This suggests that textism use may be influenced by factors beyond methodological concerns. Previous research has included data from different countries, collected in different years, and involving analyses of different combinations of factors at the expense of other possible influences on textism use. Table 2 summaries key studies of text messages written in English.

While the studies summarised in Table 2 demonstrate the variety of approaches and factors reported across papers, some publications were excluded as they did not analyse textisms in participants' messages. One study excluded from Table 2 was by Faulkner and Culwin (2005), in which analyses of the message length and purpose of each message in the texting diaries of 21 female and three male undergraduates in the UK were reported (as well as survey responses from a larger group of undergraduates). In another study not included in Table 2, by Baron and Ling (2010), two samples of UK undergraduates (68 from one university, 50% females, and 25 from another, 100% females) contributed data on length of phone ownership, length of texting experience, message frequency, and phone technology. Hofferth and Moon (2012) compared the reading proficiency and texting frequency of 1147 US children of ages 10 to 18 years. A variety of other research questions have been considered in these papers. For example, Baron and Ling (2010) included a number of other questions such as decorations and ringtones on phones, as well as the reason for sending messages and for texting rather than calling.

Results in this burgeoning field of research are difficult to interpret due to differences between samples and the inconsistency in factors included for consideration in each study, as demonstrated in Table 2. The following review of possible factors associated with textism use is designed to show that a number of these factors have been shown to be important in understanding undergraduates' textism choices.

Table 2

Summary of Participant Details, Study Design, and Factors Reported in Key Studies of Text Messaging Language in Texts Written in English.

	Grinter & Eldridge, 2003	Thurlow & Brown, 2003	Neville, 2003	Bieswanger, 2007	Ling & Baron, 2007	Massengill Shaw et al., 2007	Frehner, 2008	Plester et al., 2008	Drouin & Davis, 2009
Country	UK	UK	UK	UK	US	US	UK	UK	US
Total participants	10	135	45	-	22	86	568	65; 35 [#]	80
Age (in years)	15-16	(undergrads)	11-16	(adults)	(undergrads)	(undergrads)	17-27 [^]	10-12	18-48 (undergrads)
Sex ratio (% females)	50%	75%	100%	-	100%	-	52%	- ; 74%	70%
Message/textism collection	Diary (sent/rec. messages), discussion groups	Sent/received messages from phones	Dictation tasks	Messages from a website	Diary (sent messages)	Survey question re. textisms used	Received messages from phones	Translation into text language and vice versa	Translation into text language and vice versa, textism use survey item
Message Length	Yes	Yes	-	Yes	Yes	-	Yes	-	-
Textism density	Yes	Yes	Yes*	Yes	Yes	-	Yes	Yes	-
Attitude to textisms	-	-	-	-	-	-	-	-	Yes
Length of phone own.	-	-	Yes	-	-	-	-	-	-
Length of texting exp.	-	-	-	-	-	-	-	-	-
Messaging frequency	-	-	Yes	-	-	Yes	-	Yes	-
Phone technology	-	Yes	Yes	-	-	-	-	Yes	-
Language tasks	-	-	Yes	-	-	Yes	-	Yes	Yes

* Reported as a percentage of participants that used each type. [^] University students. [#] Data from multiple samples are separated by a semi-colon

Table 2 continued...

	Plester et al., 2009	Tagg, 2009	Kemp, 2010	Rosen et al., 2010	Bushnell et al., 2011	Coe & Oakhill, 2011	Drouin, 2011	Durkin et al., 2011	Holtgraves, 2011
Country	UK	UK	Australia	US	Australia	UK	US	UK	US
Total participants	88	16	61	335; 383 [#]	227	41	152	94	224
Age (in years)	10-12	19-68	(undergrads)	18-25	10-12	10-11	(undergrads)	17	18-41 (undergrads)
Sex ratio (% females)	63%	62%	82%	62%; 57%	66%	-	65%	26%	54%
Message/textism collection	Messages written for scenarios	Sent/received messages from friends (as above) and an online website	Textism use survey item, dictation and translation tasks	Textism use survey item, writing tasks	A list of 30 individual words translated into textese	Message written for a scenario; 16 individual words translated into textisms	Textism use survey item	Message sent in response to a message from the researcher	Sent messages copied from phones
Message Length	-	Yes	-	-	-	Yes	-	Yes	Yes
Textism density	Yes	-	Yes	Yes	Yes	Yes	-	Yes	Yes
Attitude to textism use	-	-	-	-	-	-	-	-	-
Length of phone own.	Yes	-	Yes	-	Yes	Yes	-	-	-
Length of texting exp.	-	-	-	-	Yes	-	-	-	-
Messaging frequency	-	-	Yes	Yes	Yes	Yes	Yes	Yes	-
Phone technology	Yes	Yes	Yes	-	Yes	Yes	-	-	-
Language tasks	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes	-

[#]Data from multiple samples are separated by a semi-colon

Table 2 continued...

	Kemp & Bushnell, 2011	Veater et al., 2011	Wood, Jackson et al., 2011	Wood, Meacham et al., 2011	Cingel & Sundar, 2012	De Jonge & Kemp, 2012	Drouin & Driver, 2012	Tossell et al., 2012
Country	Australia	UK	UK	UK	US	Australia	US	US
Total participants	86	65	114	119	228	53; 52 [#]	183	21
Age (in years)	10-12	10-13	9-10	8-12	10-14	18-24 (undergrads); 13-15	(undergrads)	(undergrads)
Sex ratio (% females)	70%	52%	-	59%	61%	72%; 38%	72%	48%
Message/textism collection	Dictation tasks	Sent messages copied from phones	Sent messages copied from phones	Sent messages copied from phones	Textism use survey item	Translation into text language	Sent messages copied from phones	Sent/received messages accessed directly from phones
Message Length	-	-	-	-	-	Yes	Yes	Yes
Textism density	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes ⁺
Attitude to textism use	-	-	-	-	-	-	-	-
Length of phone own.	-	Yes	-	Yes	-	Yes	Yes	-
Length of texting exp.	-	-	-	-	-	Yes	Yes	-
Messaging frequency	-	-	Yes	-	Yes	Yes	Yes	Yes
Phone technology	Yes	Yes	-	-	-	Yes	Yes	-
Language tasks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-

[#]Data from multiple samples are separated by a semi-colon. ⁺ Only emoticons were analysed.

One likely reason for varying textism densities is that messages were collected from participants in different countries. In an investigation of text messaging by undergraduates in five countries, for example, Baron (2010) found that 44% of Korean participants had sent and received more than 30 texts in the previous day, followed by 17% of Italian, 16% of Japanese, 11% of American, and only one percent of Swedish participants. Few studies have analysed messages in more than one language, but it has been shown that compared to naturalistic messages written in German, naturalistic messages written in English contained higher proportions of abbreviated textisms such as shortenings, contractions and homophones (Bieswanger, 2007) and fewer initialisms (Bieswanger, 2007) and emoticons (Frehner, 2008). Differences in textism use may occur even between messages written in the same language, but created in different geographic locations. For example, Shaw (2008) found that differences appeared between social networking homepages written only in English that were created in Ireland, England and the US. Accent-specific variations were evident in the spelling of both consonants (e.g., *thing* was respelled the most often as *fing* in England and as *ting* in Ireland) and vowels (e.g., *what* and *because* were respelled the most often as *wut* and *cuz/cus* in the US, and as *wot* and *coz/cos* in England). The development of textese within a local texting culture might be interrelated with the availability and use of phone technology, as well as attitudes of individuals towards texting and textism use. The pace at which texting culture and language develops is also likely to be affected by the volume of text messages circulated on a local level (Baron & Ling, 2010). Therefore, it is important to measure textism use in messages collected via a consistent research design across countries so that possible effects of location can be further explored.

Furthermore, differences in textism densities in messages might be related to the year in which the messages were collected. As well as possible relationships between

textism use and texting experience, phone technology has advanced over time, with varying uptake across countries (Baron & Ling, 2010). It is likely that phone technology has some association with textism use. For example, Kemp and Bushnell (2011) showed that children who used multi-press text entry (where multiple key-presses are required to select the correct letter on an alpha-numeric keypad) used higher proportions of textisms in their messages than those who used predictive software (where the phone provides word suggestions based on single key-presses). As access to updated hardware (such as full keyboards and touchscreens) and software options (such as improved predictive software) continue to increase, textism use may diminish further. Time-period, like country, is therefore potentially related to textism use via the development of textese and texters' changing attitudes towards textism use, individuals' texting experience, and advances in phone technology. However, it appears that previous studies regarding change over time have not extended beyond less than one year (Tossell et al., 2012; Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester, 2011).

Attitudes towards the appropriateness of using textisms, for example, may differ both between countries and over time. However, data are largely unavailable from which to draw conclusions, although Drouin and Davis (2009) found that participants' textism use varied in line with their attitudes towards textisms in formal and informal situations. Without studies that assess attitudes across locations or over a number of years, the interaction between attitudes and textism use is unclear. Measures of texting experience include how long individuals have been texting and how many messages they send and receive over specified periods of time. Relationships between texting experience and literacy scores have been examined in several studies, as discussed below (e.g., Kemp, 2010; Massengill Shaw et al., 2007; Plester et al., 2009). However, these studies have not

investigated the relationship between texting experience and textism use or established how these might change between locations or time-points.

Factors beyond the collective issues of participant country or change over time may also affect texters' use of text messaging language. A number of studies have included consideration of the influence of participant sex, for example, on texting volumes, message length, and textism use. A survey by Baron and Campbell (2010) showed a higher percentage of females than males had sent and received more than 30 text messages in the previous day in all five countries (Sweden, the US, Italy, Japan, and Korea) and a higher percentage of males than females in each country had sent/received fewer than five text messages. Tossell and colleagues (2012) reported both higher average message sending rates, and more words per message, for female than male undergraduates in the US. Furthermore, in scenario-based messages, female pre-teens used more textisms than males (Plester et al., 2009) and in naturalistic messages, women not only sent, but also received, approximately twice as many emoticons in text messages than men (Tossell et al., 2012). In a study involving young adults, Rosen et al. (2010) also found that females both reported sending significantly more text messages and estimated higher textism use for each textism type than males. The majority of studies of text language, especially those focused on relationships between texting and literacy skills, do not report analyses of potential sex differences (e.g., Cingel & Sundar, 2012; Coe & Oakhill, 2011; Drouin & Driver, 2012). However, there are sufficient data to show fairly consistent differences in how males and females engage with both text messaging and text language. Overall, it seems that females use more textisms and send more messages than males, which may reflect general differences in language use and expression that are subsequently manifested in their text messaging behaviour.

Another potential effect on textism use that has received little experimental attention is that of participant age. As cited above, texting remains most popular in teenagers and young adults (Faulkner & Culwin, 2005; Lenhart, 2012; Smith, 2011). In studies involving more than one age group, textism use was not significantly different in one study (16% for 13- to 15-year-olds and 14% for 18- to 24-year-olds, in translated messages, De Jonge & Kemp, 2012) and varied across ages in another (e.g., from 7-27% textisms for 9-year-olds to 44-49% for 11-year-olds, in naturalistic messages, Wood, Meacham et al., 2011). Comparisons between these studies and others that use similar methods show that children use more textisms in general than adults. As reported above, other messages from translation tasks have contained 43-57% textisms for undergraduates (Kemp, 2010), versus 57-59% for children (Plester et al., 2008). Similarly, naturalistic messages from adults have contained five percent (Ling & Baron, 2007), 19% (Thurlow & Brown, 2003) and 24-28% textisms (Drouin & Driver, 2012), which are all considerably lower than the peak of 49% observed in children's naturalistic messages (Wood, Meacham et al., 2011). Thus, while data are mixed where multiple age-groups have been involved in single studies, comparisons between studies that include single age-groups show age may be another important influence on text language choices. Higher textism use in children compared to older adults may reflect differences in attitudes as individuals develop, such as textism use being viewed as a novelty in young texters.

If the sex and age of participants affect their textism use, then these factors need to be taken into account in text messaging research. Percentages of female participants have varied greatly between studies, from 12.5% (in Faulkner & Culwin, 2005) to 100% (in Ling & Baron, 2007). Similarly, age effects may extend beyond only differentiating between children's and adults' texting. If differences exist between adults of different ages, this would be of interest to researchers who have collected text messages from

narrow age ranges in some cases (e.g., adults aged 18-25 years, Rosen et al., 2010) and without age restrictions in others (e.g., Faulkner & Culwin, 2005). These decisions are informed by issues such as the research questions under investigation and sample availability, and may (in the case of restricted age bands) pre-empt potential problems with interpreting variation between ages in adults. One advantage of including older adults, however, is that general analyses of textism use are more representative of the wider population of texters.

As summarised above, methodological factors (message collection and textism categorisation and counting), group factors (country, time, attitudes towards textisms, texting experience and developments in phone technology) and individual factors (the sex and age of participants) might affect textism use in messages. How these factors interact is not clear. For example, if attitudes towards the appropriateness of textism use are related to the actual text language used in messages, it would be useful to measure differences in attitudes between males and females, and between older and younger participants, to inform any differences in textism use between groups. Similarly, if phone technology affects textism use, then differences in phone technology use between males and females, and between older and younger participants, may also be informative. Recent attempts to differentiate these effects have produced mixed results, with some studies showing that more females use predictive technology than males (Baron & Ling, 2010; Kemp & Bushnell, 2011) and other studies showing no significant sex differences in technology use (De Jonge & Kemp, 2012; Drouin & Davis, 2009). Now that this field of research has developed to the point of identifying key factors that may be associated with textism use, the opportunity exists to differentiate how these factors interact.

Results from individual research reports, and comparisons between papers outlined above, make it clear that several different factors provide at least partial explanations as to

the differences in textism densities observed in previous research. Similar factors may have contributed to inconsistencies in results regarding links between text messaging language and individuals' literacy skills. As highlighted earlier, popular media reports have included strong criticism of texting and textism use and its potential negative effect on literacy skills (e.g., Henry, 2008; Humphrys, 2007; Llewthor, 2010). Educationalists have expressed similar concerns (e.g., Broadhurst, 2008; Geertsema, Hyman, & van Deventer, 2011; Ross, 2007). Contrary to popular media and educationalists' concerns, positive links between literacy and textism use have been found in studies of children's texting (e.g., Coe & Oakhill, 2011; Neville, 2003; Plester et al., 2009), although Cingel and Sunder (2012) recently reported a negative relationship between pre-teens' self-reports of textism use and their grammar skills. Results for links between textism use and literacy scores for adults have been negative (De Jonge & Kemp, 2012), non-significant (Drouin & Davis, 2009; Kemp, 2010; Massengill Shaw et al., 2007), and a mixture of positive and negative (Rosen et al., 2010).

In investigations of associations between textism use and individual literacy, not only has the methodology of estimates of textism use varied between studies, but the literacy tasks employed have also varied. For example, Rosen et al. (2010) asked participants to estimate their textism use for seven textism categories (e.g., "acronyms such as LOL or L8R", "removing apostrophes from contractions such as "dont" in place of don't", p. 425). Rosen and colleagues then compared these ratings to the quality of formal and informal writing samples written in response to set scenarios and to whether textisms were used in the samples. De Jonge and Kemp (2012) asked participants to translate sentences written into conventional English into textese, and compared individuals' overall textism use with their scores on spelling, nonword reading, and morphological awareness

tasks. Variations like these may at least partially explain the inconsistent results for associations between text language and individual literacy scores.

Concerns regarding links between text messaging and literacy scores may be allayed, or at least informed, by further research to clarify results, but an alternative approach is to check for negative effects of text language in school-based assessments. Despite continued debate into whether literacy standards are in decline, researchers reporting studies of GCSE exams in England from 1980 to 2004 suggested that changes in assessment standards did not fully explain increases in literacy test scores across this time period (Massey, Elliott, & Johnson, 2005). Experiments involving formal writing samples have resulted in little evidence that participants are unable or unwilling to avoid textism use in formal situations (Drouin & Davis, 2009; Rosen et al., 2010). To investigate the validity of media concerns that textisms are negatively affecting formal literacy real-world evaluations of formal assessment work for the presence of textisms are essential.

Research questions

In summary, text messaging research is a relatively new area, but researchers have already identified many methodological, group, and individual factors that may be associated with individuals' textism use. Results have been inconsistent regarding the density of textisms in messages, and the associations between textism use and other factors such as participant sex, age, and phone use. Methodological variations between studies have made varying results difficult to interpret, and the sporadic inclusion of factors that have been considered in studies has resulted in a clouded view of not only the importance of each factor, but also of how they may interact. While positive links have been observed between children's literacy skills and texting behaviours, no consistent links have established between young adults' literacy and texting. Young adults are the most prolific users of text messaging (ACMA, 2012; Ling, Bertel, & Sundsøy, 2012), and the

examination of how factors beyond literacy ability interact with textism use is particularly important for this age group, for whom literacy is generally well-established. The overall aim of this thesis is to examine the methodological and other factors that are associated with variations in undergraduates' textism use. The studies reported in the following chapters include further detailed reviews, rationales, and hypotheses regarding each factor considered above in terms of associations with young adults' textism choices in text messages written in English. A summary of these factors and general research questions follows with regard to the overall thesis structure.

Study 1 (Chapter 2). The first experimental chapter reports first-year university students' textism use in messages collected in both Australia and Canada via translation, scenario, and naturalistic collection methods.

Methodological factors. Study 1 addresses how methodological factors, namely message collection methods and the categorisation and counting of textisms, affect (perceptions of) textism use.

Country. Study 1 also reports a comparison between Australian and Canadian text messages to establish how and why text language differs between countries via a uniform experimental design across the samples.

Study 2 (Chapter 3). For this study, naturalistic text messages were collected from first-year university students in Australia across four consecutive years (2009 to 2012).

Time. Study 2 reports a comparison across the four time-points to ascertain the direction in which text messaging language is changing across time.

Phone technology. Study 2 also reports analyses of textism use as associated with differences in phone technology, both in terms of hardware (e.g., alpha-numeric keypads versus touchscreens) and software (e.g., multi-press text-entry versus predictive technology).

Sex, age and texting experience. Further analyses in Study 2 show how textism use differs between males and females, and whether textism use varies with participant age or texting experience (messages sent per day/length of phone ownership).

Study 3 (Chapter 4). Data for this study were drawn from the naturalistic messages collected in Study 1, with the addition of a number of literacy and language tasks.

Literacy task scores. Study 3.1 reports analyses of links between Canadian participants' literacy skills and textism use. Study 3.2 reports similar analyses for the Australian participants, who completed a larger set of literacy tasks.

Study 4 (Chapter 5). This chapter is comprised of two studies, both of which report further investigations into links between literacy and text messaging.

Attitudes towards textism use. Study 4.1 reports participants' opinions of how appropriate it is to use textisms in a variety of situations (e.g., in a text message to a friend compared to in an email to a lecturer). This research question was designed to investigate students' attitudes towards textism use with regard to audience and register (e.g., in informal versus formal writing). These data were collected during Study 3 from the Australian participants.

Formal writing. Study 4.2 reports an examination of a different sample of undergraduates' formal exams (collected from first-, second- and third-year students) to check for the presence of textisms. This research question addressed media concerns that text messaging has led to inappropriate use of textisms in students' formal writing.

The combined influence of factors associated with variations in textism use is considered in the General Discussion (Chapter 6). Conclusions include an overall model for the relationship between these factors (particularly literacy skill) and undergraduates' use of textisms.

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Undergraduates' use of text messaging language: Effects of country and collection method.

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Abstract

Studies of mobile phone text messaging have reported widely varying proportions of textisms (e.g., *u* for *you*, *2* for *to*). We investigated whether conclusions about textism use are influenced by participant country, text message collection method, and categorisation method. Questionnaire data were collected from 241 undergraduate students in Australia and Canada, who also provided text messages via three methods used in previous research: translation from conventional English, writing a message in response to a scenario, and providing naturalistic messages. Significantly higher proportions of textisms were observed in messages written by Australians than Canadians, and in messages collected experimentally than naturalistically. A re-categorisation of textism forms as 'contractive' versus 'expressive' was explored and overall implications for text-message collection are discussed.

Undergraduates' use of text messaging language: Effects of country and collection method

Mobile phone text messaging has continually increased in popularity since its inception in 1992 (Hillebrand, 2010). Global text messaging volume has risen from an estimated 1.8 trillion messages in 2007 to 6.1 trillion in 2010, equating to close to 200,000 messages sent per second (International Telecommunication Union, 2010). The text messaging 'language' that has been adopted and developed by users of texting (as well as of Instant Messaging) has been referred to as *textese* (e.g., Crystal, 2008; Drouin & Driver, in press; Kemp, 2010), with abbreviations sometimes called *textisms*. Textisms are often described in terms of categories such as 'single homophones' (e.g., *u* for *you*, *c* for *see*) and 'initialisms' (e.g., *lol* for *laugh out loud*) (e.g., Plester & Wood, 2009; Thurlow & Brown, 2003). However, previous research describing textese has reported widely varying estimates of mean textism density (the proportion of textisms out of all words written). Reported textism densities have ranged from 5% in American adults' naturalistic messages (Ling & Baron, 2007), to 59% in English children's translated messages (Plester, Wood, & Bell, 2008). The reasons for this variation have not been directly explored.

Sample differences: Effects of Country

Textese has been described as a hybrid of spoken and written English (Plester & Wood, 2009) because of its representation of features of spoken language. These include spellings which represent pronunciation (e.g., *cangrads* for *congrat[ulation]s*, *havin* for *having*), and the inclusion of pause fillers (e.g., *ummm...*), which are not normally represented in formal written language. The use of textisms may therefore be influenced by differences in accent and word choice between English-speaking countries. In a study of accent markers in internet homepages, Shaw (2008) observed accent-based differences in the spelling of numerous words. For example, *with* was most often respelled as *wit* in

the US and *wiv* in England. However, these kinds of differences may not affect textism counts (*wit* and *wiv* are still both textisms), and are unlikely to explain international variation in textism density.

Texting culture and technology. The uptake of mobile phone technology has varied greatly even between developed countries. In 2003, the number of mobile phones per 100 people was approximately 73 in Australia, but only 41 in Canada. By 2009 these numbers had increased to approximately 114 and 69, respectively, indicating that there are now more phones than people in Australia (CIA, 2004, 2010). Between 2003 and 2009, the iPhone and other 'smartphones' were introduced, and other forms of full keyboards became increasingly available alongside or in place of traditional alpha-numeric keypads, which require multiple key-presses to select letters and punctuation. The constraints of relying on alpha-numeric keypads for text entry have been cited by many researchers as having encouraged the development of textese (e.g., Crystal, 2008; Hillebrand, 2010). In developed countries with a relatively later or slower uptake of mobile phone technology (such as Canada), fewer phone users may have experienced the constraints of keypads. Kemp and Bushnell (2011) confirmed that text entry system type can have a significant effect on textism use. In their study, children all used alpha-numeric keypads, but those who used multi-press entry composed messages more slowly, and included more textisms, than children who instead used a predictive entry system. Predictive entry requires only a single key-press per letter, as the phone predicts the most likely word, based on the sequence of key presses.

The financial cost of sending multiple messages has also been cited as fuelling texters' use of abbreviations (Anis, 2007; Ling, 2004). It is possible that differences between countries in the price of text messages versus mobile phone calls have contributed to international differences in texting behaviour (Baron & Campbell, 2010; Baron & Ling,

2010). In recent years, changes to messaging plans to include, for example, free text messages on weekends, or multiple messages for a set cost, may have further eased pragmatic pressures to depend on abbreviated forms of spelling. As noted above, Australians have had higher levels of mobile phone ownership than Canadians throughout these changes, and this difference may have shaped the development of local texting cultures, in terms of the popularity of using textisms in general, or of using particular textism types.

Effects of methodology

Further possible explanations for variations in the use of textese by different samples lie in the ways that messages are collected, and the ways the textisms are categorised. This variability in methodology could lead to divergent conclusions about the type and extent of textism use in different participant groups, as discussed below.

Collection methods. Text messaging data have been gathered by researchers in several different ways. Some have relied on users' self-reports of their tendency to use textisms (e.g., Massengill Shaw, Carlson, & Waxman, 2007; Rosen, Chang, Erwin, Carrier, & Cheever, 2010). Some researchers (e.g., Kemp, 2010) have used translation/dictation tasks (e.g., *How would you write the following sentence as a text?*), others (e.g., Plester, Wood & Joshi, 2009) have used scenario exercises (e.g., *What would you text a friend in the following situation?*), and others have employed the naturalistic method of participants copying sent messages from their mobile phones (e.g., Ling & Baron, 2007; Thurlow & Brown, 2003). Only occasionally have researchers used more than one collection method. For example, Plester, Lerkkanen, Linjama, Rasku-Puttonen, and Littleton (2011) gathered both naturalistic and elicited messages, Drouin and Davis (2009) gathered both self-reports and translated messages, and Bodomo (2010) gathered both self-reports and naturalistic messages. However, there has been no systematic

comparison of the possible effects of different collection methods on conclusions about textism use.

Differing estimates of textism use have emerged from studies using different collection methods. In translation tasks, textism densities (proportion of textisms per total words in each message) of 43-57% have been reported in university students' messages (Kemp, 2010), and 57-59% in children's messages (Plester et al., 2008). Plester and colleagues (2009) developed scenario tasks to elicit more spontaneous messages from 10- to 12-year-olds when naturalistic message collection proved difficult, and observed a textism density of 34%. Naturalistic messages from university students have contained considerably lower textism densities, ranging from 23% (Grace, Kemp, & Martin, 2010) down to 5% (Ling & Baron, 2007).

Categorisation. Finally, previous research has used various methods of counting and categorising textisms. Some researchers have counted the number of characters added to or deleted from words (Herring & Zelenkauskaitė, 2008), while others have analysed the treatment of specific phonemes (Frehner, 2008). Many others have counted the types of transformations made, but these have been categorised in various ways. Some researchers have used the term 'clipping' to refer to any shortening in which a part of a word is deleted (Bieswanger, 2007; Herring & Zelenkauskaitė, 2008), whereas others have differentiated abbreviations more finely. For example, *Fri* for *Friday* could be categorised as a 'clipping' (Kapidzic, 2010; Shaw, 2008), a 'shortening' (Thurlow & Brown, 2003), or a 'truncation' (Anis, 2007). Abbreviations made by removing internal letters, usually vowels, have been labelled as 'contractions' (De Jonge & Kemp, 2012), or more specifically, 'suppression of vowels' (Anis, 2007). A spelling such as *u* for *you* could be categorised as an 'abbreviation' (Ling & Baron, 2007), a 'letter/number homophone' (Kapidzic, 2010; Thurlow & Brown, 2003) or a 'shortening' (Rosen et al., 2010). In all of these cases,

however, these variations in coding would not result in variation in the overall counts of textisms produced.

In other cases, the total number of textisms has been affected by differences in the types of transformation that researchers have counted. Spelling errors and typographical errors have been counted as textisms by some researchers (e.g., De Jonge & Kemp, 2012; Thurlow & Brown, 2003), but not by others (e.g., Ling & Baron, 2007; Plester et al., 2009). Similarly, lowercase *i* for *I* has been counted by some (e.g., De Jonge & Kemp, 2012; Rosen et al., 2010) and not others (e.g., Durkin et al. 2011; Plester et al., 2009). Only in rare cases have 'contractions' been defined as including, for example, *can't* for *cannot* (Ling & Baron, 2007), or have 'acronyms' been defined as including standard acronyms such as *UK* for *United Kingdom* (Plester et al., 2008).

Additional categories have also been instituted to capture the use of new expressive devices. These include 'emotion punctuation', such as (Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong, 2009), and 'all capitals', such as *I AM ANGRY* (Danet, 2001; Rosen et al., 2010). Another frequent example is the use of 'insertions' of extra letters that intensify the expressive nature of the message (e.g., *soooooo*, Herring & Zelenkauskaitė, 2008, 2009). Spellings that are made more expressive with the insertion of extra letters have also been labelled 'emotion words' (Varnhagen et al., 2009) and 'eccentric spellings' (Danet, 2001). The inclusion of such expressive devices allows recognition of the more creative strategies that texters incorporate in their messages to enhance communication (see Herring, 2001; Shortis, 2007). Statistics describing textism use have inevitably been affected by these types of variation in categorisation.

Despite the diversity of category names and definitions, a growing number of researchers are employing a relatively consistent categorisation of textisms based on the scheme developed by Thurlow and Brown (2003, following Shortis, 2001), but extended

to represent the breadth of spellings often observed (e.g., Durkin et al., 2011; Kemp, 2010; Plester et al., 2009).

Finally, reports of textism densities have been affected by the counting of words which have been transformed in two or more ways. For example the textism *im* for *I'm* could be categorised as 'missing capital' and/or 'missing apostrophe'. Some researchers (e.g., Plester et al., 2009) have categorised textisms only on the basis of the first transformation in the word, while others have considered all transformations (De Jonge & Kemp, 2012; Varnhagen et al., 2009). Categorising only the first transformations within words potentially conceals important detail about the use of each transformation type.

In undergraduate students' text messages in English, some of the most common types of textism have been reported to be omitted capitals and apostrophes, accent stylisations (such as *gonna* for *going to*), and letter/number homophones (such as *u* for *you*, *2* for *two*), in both translated and naturalistic messages (e.g., De Jonge & Kemp, 2012; Drouin & Driver, in press; Frehner, 2008; Grace et al., 2010; Ling & Baron, 2007).

Rationale

The aim of the present study was to investigate the possible effects of country, collection method, and categorisation on estimates of the prevalence and nature of textisms in undergraduates' text messages, written in English. This study provides an important first step in differentiating experimental and individual factors that could explain wide variance in previous estimates of textism use. Participants were students at two universities in two countries: Australia and Canada. We invited first-year undergraduates as participants because young adults are the primary users of texting technology (Ling, 2010). Even across countries with the same dominant language, variations in accent, as well as variable patterns of mobile phone ownership and text messaging uptake, may lead to group differences. In order to explore the factors which differ between countries but which could

also affect textism use (e.g., length of phone ownership, text input type), information about participants' phone use and behaviour was also collected.

As noted earlier, mobile phones have been in more widespread use, and for longer, in Australia than in Canada. Thus we assume that in general, Australians would have had more experience with text-messaging via the older technology of alpha-numeric keypads and multi-press entry, which encouraged the use of textisms, especially those that make words shorter. Accordingly, we hypothesised that Australian participants would produce significantly more textisms, especially those that shorten words, than their Canadian counterparts. In terms of collection method, we hypothesised that overall, students would produce significantly more textisms when translating messages than when writing them from a scenario, with the smallest proportion of textisms observed in participants' naturalistic text-messages. Finally, we aimed to explore the use of textisms of different categories, both those used previously in the literature, and in terms of contracted versus expressive forms.

Method

Participants

Participants were students in first-year Psychology and Education classes at two urban universities, one in South-Eastern Australia, and one in Western Canada. There were 97 Australian students (70 female), mean age 23.34 years ($SD = 7.85$), and 170 Canadian (132 female), mean age 22.69 years ($SD = 4.24$). All but 24 had English as their first language (nine in Australia, 15 in Canada). All students received course credit for their participation, and provided informed consent. The study had ethical approval from both universities.

Materials

Questionnaires. All participants completed a questionnaire requesting demographic information and information regarding their mobile phone's text entry systems (e.g., use of predictive text messaging), their use of text messaging (e.g., an estimate of messages sent per day), and their opinion of the appropriateness of textism use. The questionnaire is shown in Appendix 1. Data collection was completed in late 2010.

Text Messaging Tasks. Three tasks were developed to assess the three main methods that have been used in previous research for collecting text messages. The sentences used in the Translation and Scenario tasks are listed in Appendix 2, and were based on a previous sample of naturalistic text messages not analysed here.

Translation. In the translation task, students were given five written sentences (e.g., *Are you coming over today, honey? No problem if you can't.*), and asked to rewrite each one "as you would if you were going to send them as text messages", writing the messages "exactly as you would type them into your phone, with any abbreviations, emoticons etc., that you would normally use." No direct reference to 'translation' was made.

Scenario. In the scenario task, students were given five written scenarios (e.g., *Write down what you would text to set up a meeting between you and your best friend somewhere in town on Saturday night.*), and asked to "write a message for each of the following scenarios as you would if you were going to send them as text messages", with the same further instructions as above.

Naturalistic. Students were then asked to copy down the last five messages they had sent from their phones (and were comfortable sharing), including more messages as necessary to total at least 50 words overall. This number was chosen so that there would be approximately the same number of words elicited in each of the collection methods.

Participants were asked to write messages “exactly as they appear on your phone, including punctuation and emoticons”.

Procedure

Participants completed the questionnaires and text message tasks individually in a quiet room in their university. This took approximately 30 minutes, and was completed within a 45-75 minute session that included several other tasks not reported in this study. Each participant recorded messages via all three collection methods, with the order of the translation and scenario tasks counterbalanced and the naturalistic task completed third in each case.

Categorisation of textisms. We categorised textisms based on a scheme by Thurlow and Brown (2003), which has been adapted for use in several recent experimental studies of text messages in English, as discussed above. We made several minor additions and alterations to capture further detail and make comparisons across collection methods for as wide a range of textism types as possible, for example by including categories for extra punctuation, letters, and words (see Table 1).

Table 1

Categorisations Applied to Textism Transformations.

Category	Example	Category, continued	Example
Single homophones	<i>u</i> for <i>you</i> , <i>2</i> for <i>to</i>	Expressive Symbols	<i>xxx</i> , <i>xox</i> , :D, =P, -_-;
Combined homophones	<i>2nite</i> for <i>tonight</i>	Other Symbols	@ for <i>at</i> , & for <i>and</i>
Shortenings	<i>mon</i> for <i>Monday</i>	Omitted capitals	<i>i</i> for <i>I</i> , <i>sarah</i> for <i>Sarah</i>
Contractions	<i>msg</i> for <i>message</i>	Extra capitals	<i>HAPPY BIRTHDAY</i>
Omitted apostrophes	<i>cant</i> for <i>can't</i>	Extra punctuation	<i>???, !!!!!, ?!</i>
g-clippings	<i>goin</i> for <i>going</i>	Extra letters	<i>pleeease</i> for <i>please</i>
Initialisms	<i>btw</i> for <i>by the way</i>	Extra words	<i>cool cool</i>
Nonstandard spelling	<i>cos</i> for <i>because</i>	Spelling errors	<i>rekon</i> for <i>reckon</i>
Accent stylisation	<i>gonna</i> for <i>going to</i>	Other textisms	<i>abit</i> for <i>a bit</i>

As noted, some researchers have counted the number of words containing textisms, while others have counted the number of transformations made, even within words. To allow comparisons with previous research, textism densities were initially calculated via both methods, referred to as 'textism words' where each transformed word/phrase (e.g., *lolllll*) was counted as a single textism, and as 'textism events', where each transformation was counted separately (e.g., *lolllll* was counted as two textisms: 'initialism' and 'extra letters'). For both counting methods, textism density was calculated for each participant by dividing the total textisms produced by that participant by the number of words included in his or her messages.

Results

The textisms used by participants in their messages, in all three collection methods, were coded according to the categories listed in Table 1. An initial independent-samples *t*-test showed that the messages of non-native English speakers (nine Australian, and 15 Canadian students) included a significantly higher proportion of textism events (i.e., every textism counted, $M = .31$, $SD = .16$) than the native English speakers ($M = .20$, $SD = .10$), $t(265) = -3.40$, $p = .002$, although they did not differ significantly on other demographic variables (age, phone ownership, or number of sent/received messages). This relatively large difference in textism use between the two groups, as well as the linguistic disparity of the non-native group (reporting 16 different first languages), led us to restrict the analyses to the native speakers of English who also texted in English. Thus two further Australian participants who reported that they texted in other languages most of the time were also excluded.

The final sample therefore included 86 Australian (63 female; mean age 23.33 years, $SD = 8.23$), and 155 Canadian (118 female; mean age 22.57 years, $SD = 4.19$)

participants. The total number of messages collected, and the message lengths for each country and collection method, are shown in Table 2.

Table 2

Total Number of Messages and Mean Message Lengths (Standard Deviations in Parentheses) for Each Method and Country.

	Collection Method					
	Translation		Scenario		Naturalistic	
	<i>n</i>	Words/Message	<i>n</i>	Words/Message	<i>n</i>	Words/Message
Australia	430	10.69 (2.46)	430	12.36 (5.56)	477	12.62 (8.59)
Canada	765	10.64 (2.42)	775	11.61 (5.03)	840	11.80 (7.71)
Overall	1195	10.65 (2.42)	1205	11.88 (5.23)	1317	12.10 (8.04)

Note: The messages from two participants were excluded as they contained replies to sentences rather than the requested translations

In total, the Australian students provided 1337 messages (approximately 16,000 words), and the larger sample of Canadian students provided 2380 messages (approximately 27,300 words). This provided a mean of approximately 180 words per student. Textism data were combined across collection methods to compare counting methods by calculating an overall density for both textism words and textism events, as reported in Table 3.

Calculating textism densities for textism words combined across methods and countries produced an overall mean proportion of .18 ($SD = .09$), whereas calculating each textism event produced an overall mean proportion of .19 ($SD = .19$). The .01 difference in textism density between the two counting methods is small, but represents approximately 660 transformations (or 8% of all textism events) that may have otherwise been ignored

(e.g., the missing apostrophe in *im* for *I'm*). All further analyses were therefore conducted using the textism events data.

Table 3

Mean Textism Densities (Standard Deviations in Parentheses) for 'Textism Words' and 'Textism Events', and t-test Values for the Difference in Textism Densities Between Countries.

	Country		<i>t</i> -value	Effect size (η^2)
	Australia (<i>n</i> = 86)	Canada (<i>n</i> = 155)		
Textism words	.20 (.10)	.16 (.07)	3.13*	.04
Textism events	.22 (.12)	.18 (.08)	3.06*	.04

Note: For textisms words, each transformed word was counted once; for textism events, each transformation was counted, even if there was more than one within a word.

* $p < .005$

Effects of Country: Attitudes, Texting Experience and Technology

The questionnaire included a 5-point Likert scale item designed to capture students' opinions regarding the appropriateness of using text message-type abbreviations when texting a friend (where 1 = *not at all appropriate* and 5 = *entirely appropriate*). An independent-samples *t*-test revealed that the ratings did not differ significantly between Australia ($M = 4.48$, $SD = 0.86$) and Canada ($M = 4.54$, $SD = 0.78$), suggesting that any differences in textism use between the countries cannot be explained by differences in students' attitudes regarding the appropriateness of textism use.

Demographic data regarding students' phone use are summarised in Table 4. The table also displays the results of *t*-tests which confirmed that the Australian students had owned phones for significantly longer than the Canadian students, although the Canadian students gave significantly higher mean estimates of messages sent and received per day.

Table 4

Means (Standard Deviations in Parentheses) for Mobile Phone Ownership and Text Messaging Use, with t-values Showing Differences between Countries.

	Country		<i>t</i> -value	Effect size (η^2)
	Australia (<i>n</i> = 86)	Canada (<i>n</i> = 155)		
Phone ownership (years)	7.13 (2.44)	5.91 (2.37)	3.78**	.06
Texts sent per day	23.93 (31.90)	39.12 (44.17)	3.06*	.04
Texts received per day	23.97 (31.71)	39.27 (44.14)	3.10*	.04

Note: The score for one (Canadian) outlier, who reported sending 1000 messages per day, was excluded from the analysis.

* $p < 0.01$, ** $p < 0.001$

Pearson correlation coefficients were calculated for each country to explore whether factors of texting experience (phone ownership and sent message volumes) are related to textism use. Overall textism density (collapsed across collection methods) was not significantly related to the length of time that students had owned mobile phones in either country (Australia: $n = 86$, $r = .11$, $p = .31$, Canada: $n = 155$, $r = -.03$, $p = .72$). The correlation between textism events and number of messages that students sent daily was not significant for Canadian students ($r = .05$, $p = .53$), but it was for Australian students ($r = -.22$, $p = .05$). Contrary to our hypothesis, in the Australian sample, more frequent senders of messages used fewer textisms. Students also noted their text messaging hardware and software as reported in Table 4. Hardware options were whether their mobile phone had a full keyboard or touchscreen, an alpha-numeric keypad, or both. Software options were whether participants used single-press entry with predictive software (which can apply to either full keyboards or alpha-numeric keypads), or multi-press key entry (which involves pressing a key one to four times to select each letter). The percentages shown in Table 5 regarding software use reflect the text entry strategy used *most* of the

time. However, it should be noted that approximately 38% of the Australian and Canadian students reported using multiple entry systems at least some of the time (e.g., switching between multi-press and single-press predictive texting). Australian students reported using phones with alpha-numeric keypads and with full keyboards approximately equally, whereas for Canadians, full keyboards were much more widely used. Reflecting these differences, Australians reported using predictive entry most commonly, whereas Canadians used non-predictive entry most commonly.

We conducted two two-way analyses of variance (ANOVAs) to examine the effect of hardware and software use on the density of textism events in students' text messages. (The few students who reported using both hardware systems, or using several software systems approximately equally, were excluded.) The ANOVA testing the potential influence of hardware choice on textism use had one between-subjects factor, Country (Australia, Canada), and one within-subjects factor, Hardware Type (alpha-numeric keypad, full qwerty keyboard). There was a significant main effect of Country, with more textisms produced by Australian than Canadian students, $F(1, 232) = 7.08, p = .008, \eta^2 = .03$, and a significant main effect of Hardware Type, with more textisms produced by users of alpha-numeric keypads than full keyboards, $F(1, 232) = 6.25, p = .01, \eta^2 = .03$. The interaction between Country and Hardware Type was not significant, $F(1, 232) = 0.75, p = .39, \eta^2 = .003$.

The ANOVA for students' use of textisms according to mobile phone software had one between-subjects factor, Country (Australia, Canada) and one within-subjects factor, Software Type (multi-press, predictive, non-predictive). Significantly more textisms were produced by Australian than Canadian students, $F(1, 233) = 11.31, p = .001, \eta^2 = .04$, and the main effect of Software Type was also significant, $F(2, 233) = 7.98, p < .001, \eta^2 = .06$.

Table 5

Percentages of All Students Regarding Their Self-Reported Phone and Textism Use, and Mean Proportions of Textism Events (Standard Deviations in Parentheses).

	Country					
	Australia (<i>n</i> = 86)		Canada (<i>n</i> = 155)		Overall (<i>n</i> = 241)	
	% of students	Textism Proportions	% of students	Textism Proportions	% of students	Textism Proportions
Text entry: hardware						
Keypad (alpha-numeric)	53	.24 (.12)	28	.20 (.09)	37	.22 (.11)
Keyboard (one letter/key)	47	.20 (.12)	66	.17 (.08)	59	.18 (.09)
Both systems used	0	-	5	.15 (.07)	3	.15 (.07)
Text entry: software ¹						
Multi-press	14	.32 (.15)	9	.21 (.10)	11	.26 (.13)
Single-press predictive	55	.21 (.09)	34	.19 (.09)	41	.20 (.09)
Single-press non-predictive	31	.20 (.12)	54	.17 (.07)	46	.18 (.08)
Multiple systems equally	0	-	3	.15 (.10)	2	.15 (.10)
Use of textisms in messages						
Most of the time	0	-	2	.23 (.07)	1	.23 (.07)
Some of the time	57	.28 (.12)	46	.23 (.08)	50	.25 (.10)
None of the time	43	.15 (.06)	52	.13 (.05)	49	.14 (.06)

Note: Due to rounding, some percentages do not add to 100.

¹ System used most of the time

Tukey post-hoc tests showed that messages written by students who relied predominantly on multi-press entry contained more textisms than messages written by those who used single-press predictive ($p = .006$), or non-predictive ($p < .001$) systems. Messages written by students who used predictive systems contained more textisms than those written by students who used non-predictive systems, but this difference was not significant ($p = .18$). The interaction between Country and Software Type was not significant, $F(2, 233) = 2.06$, $p = .13$, $\eta^2 = .02$.

Although we did not make specific hypotheses about participants' reports on their typical use of textisms, questionnaire data revealed that only three students reported using textisms "most of the time" in their everyday messages, and approximately half of the participants in both countries rated their textism use as occurring "some of the time", and half as "none of the time". As the participants who selected "none of the time" used textisms for about 13% of the words in the naturalistic messages that they provided, it seems that students' ability to judge their own textism use was not necessarily accurate.

Effects of Collection Method

We then considered the important question of whether the proportion of textisms produced by students in the two countries varied with collection method, as seen in Table 6.

As shown in the table, Australians used more textisms than Canadians in each method, and students in both countries used more textisms in the translation than in the scenario messages, and, in turn, in the scenario than in the naturalistic messages. A repeated-measures ANOVA was conducted with one between-subjects factor, Country (Australia, Canada), and one within-subjects factor, Method (translation, scenario, naturalistic), with mean proportion of textism events as the dependent variable. The order in which the translation and scenario tasks were administered did not make a significant

difference to proportion of textisms produced, $F(1, 229) = 0.21$, $p = .65$, $\eta^2 = .001$, and thus was not included in our analyses.

Table 6

Mean Proportions of Textism Events (Standard Deviations in Parentheses) for Each Collection Method.

	Collection Method					
	<i>n</i>	Translation	<i>n</i>	Scenario	<i>n</i>	Naturalistic
Australia	86	.27 (.18)	86	.22 (.13)	86	.19 (.09)
Canada	152	.20 (.12)	155	.18 (.10)	150	.16 (.09)
Overall	238	.23 (.15)	241	.20 (.11)	236	.17 (.09)

Note: Means were calculated by averaging individual student means.

There was a significant main effect for Country, $F(1, 231) = 10.03$, $p = .002$, $\eta^2 = .04$, with Australians producing more textisms than Canadians. A significant main effect of Method was also found, $F(2, 462) = 38.45$, $p < .001$, $\eta^2 = .14$. Tukey post-hoc tests confirmed that, as predicted, translated messages contained more textisms than scenario-elicited messages, which in turn contained more textisms than the naturalistic messages ($ps < .01$). The interaction between Country and Method was not significant, $F(2, 462) = 2.47$, $p < .09$, $\eta^2 = .009$. Thus, textism collection method does appear to influence textism use, but this does not vary significantly across the two countries.

Categorisation of Textisms

Textisms were coded according to the 19 categories used in previous research, as noted earlier, so that we could determine the potential effects of collection method on types of textisms produced. The means and standard deviations for textism events within these categories are reported in Table 7. Categories which occurred less than 0.01 of the time (g-clippings, other symbols, extra punctuation/letters/words, spelling errors, other textisms) were combined into 'other categories'.

Table 7

Mean Proportions (Standard Deviations in Parentheses) of Textism Events in Each Category for Both Countries and Each Collection Method.

	Australia			Canada		
	Translation	Scenario	Naturalistic	Translation	Scenario	Naturalistic
Single Homophones	.04 (.07)	.04 (.07)	.02 (.03)	.02 (.04)	.02 (.04)	.01 (.02)
Combined Homophones	.02 (.03)	.01 (.01)	.00 (.01)	.00 (.01)	.00 (.01)	.00 (.00)
Shortenings	.03 (.03)	.02 (.02)	.01 (.02)	.02 (.02)	.01 (.01)	.01 (.02)
Contractions	.02 (.02)	.01 (.02)	.01 (.01)	.02 (.02)	.01 (.01)	.00 (.01)
Omitted Apostrophes	.04 (.04)	.01 (.01)	.01 (.02)	.00 (.01)	.00 (.01)	.00 (.01)
Initialisms	.01 (.01)	.00 (.01)	.01 (.02)	.01 (.01)	.00 (.00)	.01 (.02)
Nonstandard Spellings	.02 (.03)	.00 (.01)	.01 (.01)	.01 (.01)	.00 (.01)	.00 (.01)
Accent Stylisation	.03 (.03)	.05 (.03)	.04 (.03)	.02 (.02)	.06 (.03)	.04 (.03)
Expressive Symbols	.02 (.03)	.03 (.03)	.04 (.04)	.01 (.02)	.02 (.02)	.01 (.01)
Omitted Capitals	.03 (.03)	.03 (.03)	.04 (.03)	.03 (.03)	.04 (.04)	.04 (.04)
Extra Capitals	.01 (.02)	.00 (.00)	.00 (.01)	.01 (.02)	.01 (.02)	.00 (.01)
Other Categories	.01 (.02)	.01 (.02)	.01 (.01)	.02 (.03)	.02 (.03)	.02 (.02)

As can be seen in Table 7, overall the highest proportions of textisms were accent stylisations, omitted capitals, and homophones, followed by shortenings, contractions and omitted apostrophes. Patterns were similar between Australia and Canada, with the exceptions of homophones, omitted apostrophes, and expressive symbols, which occurred much more frequently in the Australian messages. However, consistent differences can be seen across collection methods. It appears from the means that for both countries, there was a higher mean proportion of textism transformations in the categories of single homophones, combined homophones, and contractions in the translation condition than the scenario condition, and in the scenario condition than the naturalistic condition. These categories contain words that are shortened in some way (*e.g.*, *2day* for *today*, *@* for *at*). Conversely, proportions of transformations in three categories involving the addition of characters (expressive symbols, extra letters and extra words), were found in the highest proportions in the naturalistic condition, and in the lowest proportions in the translation condition. In order to examine such broader patterns, we grouped transformation types into two new, larger categories: 'contractive' and 'expressive' textisms.

Contractive versus expressive textism types. Contractive textisms were defined as transformations in which characters were omitted from standard words, and therefore included all textisms previously coded as contractions, shortenings, g-clippings, omitted apostrophes, initialisms, other symbols, combined and single homophones, and other textisms. Expressive textisms were defined as transformations in which extra characters were added to words or messages, and therefore included all textisms previously coded as expressive symbols, extra words, extra letters, and extra punctuation. All of these transformations appear to add expressive intent to the message. This method of categorisation excluded categories that contained a mixture of contractive and expressive forms (accent stylisations and nonstandard spellings), and categories that could not easily

be associated with either broader category (e.g., spelling errors); approximately 44% of textism events. Figure 1 summarises the resulting textism densities within each of these broader categories.

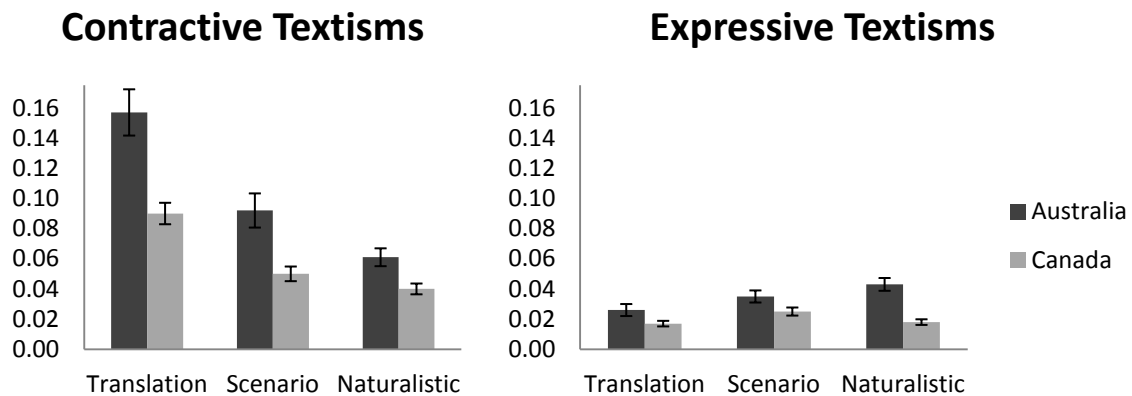


Figure 1

Mean Proportions (and Standard Errors of the Means) of Contractive and Expressive Textism Events in Each Collection Method for Both Countries.

As shown in the figure, there were more contractive than expressive textisms for both countries and across all three collection methods. Similar to results for overall textism density, Australians used more textisms than Canadians in each method, and students from both countries showed decreasing use of contractive textisms with increasingly realistic message types. However, the opposite trend was seen for expressive textisms, with increasing use of expressive textisms in increasingly realistic text messages.

A repeated-measures ANOVA was conducted with one between-subjects factor, Country (Australia, Canada) and two within-subjects factors, Method (translation, scenario, naturalistic) and Textism Type (contractive, expressive). The contractive and expressive data were not normally distributed, and therefore an arcsine transformation was made to the data before the ANOVA was conducted. Significant main effects were found for Country, $F(1, 237) = 37.29, p < .001, \eta^2 = .14$; Method, $F(2, 474) = 29.93, p < .001, \eta^2$

= .03; and Textism Type, $F(1, 237) = 108.16, p < .001, \eta^2 = .28$. These main effects were qualified by a significant interaction for Method by Textism Type, $F(2, 474) = 84.99, p < .001, \eta^2 = .09$. Interactions for Country by Method, $F(2, 474) = 1.05, p = .35, \eta^2 = .001$, and Country by Textism Type, $F(1, 237) = 1.75, p = .19, \eta^2 = .005$, were not significant. However, there was a significant three-way interaction between Country, Method and Textism Type, $F(2, 474) = 9.46, p < .001, \eta^2 = .01$.

A series of Tukey post-hoc tests were conducted on the three-way interaction. While in all cases Australians used more textisms than Canadians, Tukey post-hoc tests confirmed that this was significant for contractive textisms in the translated and scenario messages, $ps < .01$, and the naturalistic messages, $p < .05$, and for expressive textisms in the naturalistic messages only, $p < .01$. Similarly, there were more contractive than expressive textisms in all cases. This was significant for both countries in the naturalistic and scenario messages, $ps < .01$, but only for Canadians in the naturalistic messages, $p < .05$.

There were some differences in the ways that contractive and expressive textisms were used, depending on the collection method and the country. For contractive textisms, proportions were higher for students in both countries in the translation than in the scenario messages, and in turn, in the scenario than in the naturalistic messages. However, Tukey post-hoc tests confirmed this was significant for only translated compared to scenario and naturalistic messages for both countries, $ps < .01$, and for scenario compared to naturalistic messages for Australia, $p < .01$. For expressive textisms, Tukey post-hoc tests revealed that for Australians, proportions were significantly lower in translated than in the scenario messages, and in the scenario than in the naturalistic messages, $p < .01$, but for Canadians, no differences reached significance.

Discussion

The focus of this research was to investigate the potential effects of country, text message collection method and textism categorisation on measures of undergraduates' textism use. The results show that the number and type of textisms present in students' messages varied with the country in which messages were collected (Australia or Canada), and by the method by which messages were collected (translation, scenario, or naturalistic methods).

Effects of Country

The use of textisms differed significantly between countries, with Australian students using more textisms than Canadians in every analysis. These differences suggest that effects of country may explain some of the inconsistency in previously reported textism densities (e.g., Grace et al., 2010; Ling & Baron, 2007; Thurlow & Brown, 2003). There are various potential explanations for why textism use should differ between countries, but we had hypothesised that differences in mobile phone technology and texting experience were likely to be at their hub. As outlined earlier, patterns of mobile phone ownership have varied between Australia and Canada (CIA, 2004, 2010), and the use of technologies such as full keyboard entry systems and predictive texting also differed for our participants. In our sample, Australian students had owned a phone longer, whereas Canadian students sent more messages daily. However, neither length of phone ownership nor daily message sending rates was significantly correlated with students' textism use. Therefore the hypothesis that longer texting experience (during the more abbreviation-rich early development of textese) would have a measurable influence on textism density was not supported. However, Australian students, with longer experience on alpha-numeric keypads, did use significantly more word-shortening textisms than their Canadian counterparts, as hypothesised.

Students' opinions regarding the appropriateness of textism use were almost identical between the countries, a finding which rules out local differences in attitudes as an alternative explanation for differences between countries. However, as also found by Kemp and Bushnell (2011), the participants who used multi-press systems produced significantly more textisms overall than students who used single-press entry systems (either predictive or non-predictive). Further, higher proportions of textisms were used by students who relied on alpha-numeric keypads than full keyboards. Reflecting these results, Australian students used a higher proportion of textisms, and were more likely to use alpha-numeric and multi-press systems than Canadian students, who were more likely to use non-predictive and full keyboard entry systems. Therefore, the reason for the greater textism density observed in Australian than Canadian students' messages seems to stem from current differences in hardware and software use, rather than from differences in overall texting experience. Continued advances in keyboard design and predictive technology may influence the overall proportion of textisms that students employ in the future.

Effects of Methodology (collection method and categorisation)

Differences in methodology employed in previous research, in both collection and categorisation of textisms, may also explain differences in reports of textism densities. In the current study, participants produced significantly more textisms overall in the translation than in the scenario messages and in the scenario than in the naturalistic messages. These results support our hypothesis that artificial methodologies may elicit higher textism densities from students than are found in real-life messages, and would help to explain similar patterns in previous reports of students' textism use, depending on message collection method (e.g., Grace et al., 2010; Kemp, 2010; Plester et al., 2009).

It makes sense that elicited and especially translated messages should contain more textisms than naturalistic messages. Our translated and scenario messages were based on naturalistic messages collected in previous work. These messages thus contained a relatively high number of words and phrases that are frequently abbreviated, such as *by the way*, and may have contributed to the higher textism densities observed in these messages than in the more varied naturalistic messages. Further, in this research and in previous studies as well, perceived researcher expectations may prime participants to use more textisms when they know they are participating in an experimental study on texting. Similar reasons may underlie the higher proportion of contractive textisms found in translated and scenario messages than in messages copied from students' phones. The experimental setting may preclude the full expression of emotion, tone of voice, and facial expression that students try to represent in real-life messages (e.g., *xoxo*, *heeelllloooo*, and *:-p* respectively). Any combination of these factors may have affected previous study of the links between textism use and literacy skills (e.g., Drouin & Davis, 2009; Kemp & Bushnell, 2011; Wood, Jackson, Hart, Plester, & Wilde, 2011). Although both of these issues represent potential limitations in the design, they also provide evidence that the collection of translated and elicited messages does not necessarily provide an accurate estimate of the naturalistic use of textisms in a given sample. A minor but interesting finding was that students' self-reports of textism use in a questionnaire item were not reliable, with about 13% textisms observed even in the naturalistic messages of those who reported that they normally used no textisms. Researchers would thus do well to interpret results in previous research with potential effects of collection method in mind, and to use naturalistic messages where possible.

In terms of the type of textism categorisation used in previous studies (e.g., Plester et al., 2009; Thurlow & Brown, 2003), the patterns of textism use seen across all three

collection methods in the present study were broadly similar to those reported by previous researchers (e.g., De Jonge & Kemp, 2012; Drouin & Driver, in press). However, textism transformations have been counted and categorised in slightly different ways, which could have an effect on the specific conclusions drawn. By counting all textism transformations, even when more than one appeared in a word (which we referred to as 'textism events'), some textisms were analysed that would have otherwise been ignored. We also extended a commonly used categorisation schema (based on Thurlow & Brown, 2003) to include categories that recognise the expressive nature of some textisms (e.g., the insertion of extra letters, as in *sooo* for *so*). The combination of these strategies captured detail in the pattern of textism use that in turn led to a simplified, broader categorisation of textisms. The new categories of textism transformations were 'contractives' (with characters removed, e.g., *pls* for *please*) and 'expressives' (with characters added, e.g., *pleeease* for *please*). The term 'expressive' refers to the emotional intent and added communicative value contained in these textisms. We found that participants used significantly more contractive than expressive textisms, a result similar to that reported by Herring and Zelenkauskaitė (2008, 2009).

Analyses of the broader categories showed that while students overestimated their everyday use of contractive textisms in the experimental methods (translation and scenario), they may have underestimated their use of expressive textisms in the same. Mean proportions of contractive textisms were higher in the translation than in the scenario messages for both countries, and in the scenario than naturalistic messages for Australia. Therefore, results based on experimental methods may lead not only to exaggerated estimates of textism use overall, but more specifically to exaggerated estimates of the abbreviated forms of textisms referred to in media concerns regarding texting effects on literacy (see Thurlow, 2006). Conversely, aspects of heightened communication used in

naturalistic messages, such as representations of tone of voice (e.g., *pleeease*), and facial expression (e.g., :-D), may have been underrepresented.

The present study shows that the factors of country and methodology may explain some differences in the density of textisms reported in previous research. It appears that Australians' tendency to use more textisms than Canadians may be explained in terms of Australians' greater use of older technology, the constraints of which encourage abbreviated messaging. Further, naturalistic text messages seem to show lower densities of textisms than do messages collected via translation or scenario elicitation tasks. Future researchers would do well to collect naturalistic messages where possible. Finally, texters continue to create a wide variety of textisms and while expressive devices have often been neglected in previous research, they do account for a number of the textism types used in naturalistic messages. Therefore, we recommend that future researchers consider the use of expressive devices in examinations of language use in text messages.

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Appendix 1

Text messaging questionnaire

Age: _____ years and _____ months

Sex: Male Female

Is English your first language? Yes No **If No:** What is your first language? _____

Do you always send and receive messages in English? Yes No

If No: What percent of the time do you **send** _____% and **receive** _____%

text messages in English? What other languages do you text in? _____

1. How long have you owned a mobile phone? _____ months OR _____ years

2. How often do you usually send or receive text messages? On average, about:

Send: _____ messages per day **Receive:** _____ messages per day

3. What type of keypad does your phone have?

☐ Alpha-numeric keypad (with letters written above number keys like on a landline phone)

☐ Qwerty keypad (like a computer keyboard)

☐ Touch-screen keypad (with separate touch-screens for numbers/letters/symbols)

☐ Other (please explain) _____

4. About what percent of the time do you use each of the following text entry systems? % of the time

Single-press predictive (press each key once and phone predicts likely word) _____

Single-press non-predictive (press each key once without needing/using prediction) _____

Multi-press (press each number key 1 to 4 times for the right letter) _____

Other (please explain) _____

5. Which statement best describes the way that you **write** text messages? Tick one.

I use abbreviations and “text message” style spellings for...

☐ Most of the words that I write.

☐ Only some of the words, such as “u” for “you”.

☐ Nothing at all; I try to write all my words in conventional English.

6. Which statement best describes the way you feel when you **read** text messages? Tick one.

When I read a text message that is full of abbreviations and “text message” spellings...

- ☐ I find it easy to work out what the sender meant.
- ☐ I know the obvious abbreviations, but I sometimes struggle with the more obscure ones.
- ☐ I find it difficult to work out many of the abbreviations.

7. How **appropriate** do you think it is to use text-message-style abbreviations in each of the following type of message? (e.g., “u” for *you*, “lol” for *laughing out loud*, smiley faces)

Texting a friend: Not at all appropriate 1 2 3 4 5 Entirely appropriate

[Other appropriateness items are not analysed in this paper.]

Appendix 2

Sentences used in the translation exercise:

1. Are you coming over today, honey? No problem if you can't.
2. Happy birthday! See you tonight at seven o'clock. It's going to be awesome!
3. Yes, love, let's meet at Lazenby's on Friday, 11.45am.
4. Do you want to get your dad to pick us up, because Sarah can't, okay?
5. By the way, did you get my text about tomorrow?

Sentences used in the scenario exercise: Write down what you would text to...

1. Set up a meeting between you and your best friend somewhere in town on Saturday night.
2. Your mum to ask her if she can pick something up from the supermarket for you on her way to your place.
3. A friend to tell them you are going to be five minutes late to meet them.
4. Congratulate your study partner on finishing a big essay and to ask them if they are going to attend a party that night.
5. Someone you know from uni to find out whether or not they are going to go to a lecture this afternoon, and whether they can take notes on your behalf.

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3

Text messaging language: A comparison of undergraduates' naturalistic textism use in four subsequent cohorts

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Abstract

Text messaging is a ubiquitous form of computer-mediated communication, especially among university students, that is of interest to educators and linguists alike. An increasing body of research has examined the language used in text messaging, but little or no data exist regarding how the use of non-conventional spellings, or ‘textisms’, may change over time. This study reports on naturalistic messages gathered in four consecutive years from Australian undergraduates. Textism use (in particular, ‘contractives’ such as *wht* for *what*) decreased during this time-period, in step with the use of newer text-entry systems (e.g., predictive software). We found that females used significantly more textisms in general, and more expressive textisms (letters added for expressive intent, such as *whaaat?!!* for *what*) in particular, than males, and that the use of contractive textisms increased with age. Overall our results suggest that textism use may continue to decrease as abbreviated language loses its appeal in a landscape of improved technology.

Keywords: Texting, Textisms, SMS Language, University students, Cell phones, Communication

Text messaging language:

A comparison of undergraduates' naturalistic textism use in four subsequent cohorts

In the last two decades, mobile phone ownership has continually increased in popularity, with current mobile phone subscriptions reaching 5.9 billion in a current world population of 7 billion people (International Telecommunications Union, 2011). Similarly, the number of mobile phone subscriptions in Australia rose in 2011 to exceed 29 million (Australian Communications and Media Authority, ACMA, 2011) in a national population of fewer than 23 million people (Australian Bureau of Statistics, 2011). Text messaging volumes in Australia have now reached an estimated 36.3 billion texts sent in the year ending June, 2011 (ACMA, 2011). These text messages often include *textisms* (e.g., initialisms such as *lol* for *laugh out loud*, abbreviations such as *cos* for *because*, and emoticons such as ☺), which have been described by numerous authors (e.g., Crystal, 2008; Plester & Wood, 2009; Thurlow & Brown, 2003). The richly abbreviated language of text messages initially developed in response to 160-character message limits and physical constraints of alpha-numeric keypads, on which words are spelt using multiple key-presses ('multi-press') for each letter or number (e.g., Crystal, 2008; Hillebrand, 2010). While text messaging volumes have increased, technological constraints on text message length have decreased, reducing the pressure to abbreviate spellings. The aim of the current study was to investigate changes over time in the types and proportions of textisms present in adults' text messages, by comparing the naturalistic messages of four cohorts of first-year undergraduates in Australia.

Change over time

In the mid to late 2000s, changes to phone technology included developments in both hardware and software systems. Current mobile phone hardware options increasingly

include full keyboards, rather than the original alpha-numeric keypad, in which three or four letters were represented on each number key, allowing multi-press entry.

Improvements have also been made to predictive software systems, which work to predict the intended word from a sequence of single key-presses. Further, advances in technology now allow concatenation of messages (where multiple 160-character messages are linked to appear as one) and message pricing continues to decrease (Ling, 2004; Taylor & Vincent, 2005). If the constraints of the earlier multi-press entry systems encouraged textism use in years past, the alleviation of such constraints may have caused a reciprocal decrease in textism use more recently.

There is some evidence that changes in technology may indeed reduce the use of abbreviated spelling of words. People who use predictive texting have been shown to write longer messages (adolescents and adults, Ling, 2007), and to write messages faster and use fewer textisms (children, Kemp & Bushnell, 2011), than people who do not. It is possible that newer phone technology is reducing people's need to produce shortened versions of words. Alternatively, individuals who prefer to type longer messages and use fewer textisms may be more likely to adopt such new technology earlier and more fully. In any case, the prevalence of predictive software use is increasing over time, and may also vary with age. Predictive entry was reported by 47% of Neville's (2003) sample of British girls aged 11-16 years (who all also used multi-press entry at least some of the time), and by 55% of Plester, Wood, and Joshi's (2009) sample of British 10- to 12-year-olds. More recent studies of undergraduates have reported greater percentages of participants predominantly using predictive text entry, ranging from 72% (with 56% using predictive all the time; Kemp, 2010) to 86% (Jonge & Kemp, 2012) in Australia. In the US, Baron and Ling (2010) reported that 67-70% of undergraduates 'ever' used predictive technology

and 47-57% ‘always’ used it. However, it appears that the prevalence of predictive texting has not spelled an end to textism use.

There is some evidence that compared to predictive text-entry, multi-press entry is associated with greater textism use. When undergraduates translated conventional English messages into textese using multi-press entry, their messages contained 43-57% textisms (Kemp, 2010), compared to the 14% produced by undergraduates in a later study using predictive entry (De Jonge & Kemp, 2012). Even within a single study, Kemp and Bushnell (2011) found that the messages of children who used multi-press texting contained 48% textisms, whereas messages created by users of predictive entry averaged 27% textisms. As noted above, textism use may be influenced by the technology that people choose, but it is also possible that individuals choose technology to suit their preferred texting style.

Not all textisms are constructed in the same way, and one clear difference is whether the original words are shortened or lengthened. Here we follow Grace, Kemp, Martin, and Parrila (2012) in referring to shortened and lengthened textisms as ‘contractive’ and ‘expressive’, respectively, but similar groupings have also been categorised in the literature as ‘deletions’ and ‘insertions’ (Herring & Zelenkauskaitė, 2009) or ‘linguistic’ and ‘contextual’ textisms (Rosen, Chang, Erwin, Carrier, & Cheever, 2010). We define contractive textisms as those based on any shortening of the original word (e.g., *wht* for *what*, *wont* for *won’t*). Conversely, ‘expressive’ textisms can enhance the emotional content of a message by conveying information such as the intent of the sender (Herring & Zelenkauskaitė, 2009) by adding extra letters, punctuation (e.g., *whaaat?! for what*), or symbols, including emoticons (e.g., *:-D*). An increase in the use of predictive software and full keyboards could lead to a decrease in the need to use contractive textisms. However, the use of expressive textisms, which do not represent an

attempt to save on message typing time or length, but an injection of emotion or extra meaning to a message, could remain or even increase.

Beyond technological influences, social factors, such as the perceived social value of participating in textism-rich communication, may also influence textism use (Alonso & Perea, 2008; Androutsopoulos, 2006; Reid & Reid 2004). Previous research (Grace et al., 2012) has shown that textism density in undergraduates' naturalistic text messages is positively related to their ratings of the appropriateness of using textisms in their own messages. In a study of US undergraduates, Drouin and Davis (2009) also found that students rated textism use as appropriate in messages to friends but not in messages to university instructors, and varied their own textism use accordingly. It is not clear whether textism use is becoming more acceptable (as people adjust to its presence) or less acceptable over time (as it loses its novelty value). Either way, changes in students' opinions of the appropriateness of textism use over time might be reflected in subsequent changes in textism use.

Sex differences

Previous research has revealed some sex differences in computer-mediated communication. For example, messages written by men and women have been shown to differ qualitatively (e.g., women are more likely to communicate affection and men to communicate aggression, Baron & Campbell, 2010; Herring, 2003, and women use emoticons more often than men, Tossell et al., 2012). Messages written by men and women also differ quantitatively (women generally send more, and longer, messages than men; see Baron & Campbell, 2010; Tossell et al., 2012). Further, females have often been found to use more textisms than males, in studies of pre-teens' text messages in the UK (Plester et al., 2009), teenagers' instant messages in Canada (Varnhagen, McFall, Pugh,

Routledge, Sumida-MacDonald, & Kwong, 2009), and adults' text-messages in Italy (Herring & Zelenkauskaitė, 2008) and the US (Rosen et al., 2010).

If males and females have adapted to new technology at different rates, this might contribute to the sex differences that have been observed. In a study of 10- to 12-year-olds in Australia, Kemp and Bushnell (2011) found that girls were more likely to use predictive texting than boys. For boys, predictive texters used more textisms than multi-press users, but this was not evident for girls. Baron and Ling (2010) observed that in a sample of US undergraduates, women were more likely to use predictive technology than men (textism density was not reported). In a survey of 1000 Norwegian adults, Ling (2007) found that on average females provided longer messages than males, but results were mixed regarding men and women's use of predictive software. Other studies have found no differences between males and females in either use of predictive technology or in texting behaviour (De Jonge & Kemp, 2012; Drouin & Davis, 2009). The question of sex differences, and the possible mediation of technology, deserves further consideration.

Effects of age

Text messaging has been embraced predominantly by adolescents, who have developed their own linguistic style, which has then been gradually adopted by others, even those who are well into their adult years (Ling, Bertel, & Sundsøy, 2012). In a study of nearly 400 million Norwegian texts, Ling et al. found texting rates peaked at about 18 years of age, with far fewer texts being sent by pre-teens and adults over the age of sixty. A six-year longitudinal study (Ling, 2010) found a similar pattern (although with a slightly later peak). It is suggested that there may be a social reason for this late adolescent/young adult peak in message-sending, such as the adolescent transition from having parents to having peers as the centre of their social worlds (Ling et al., 2012).

Although there has been little research specifically on the relationship between age and textism use, data from existing studies suggest that textism use varies between childhood and adulthood. In experimentally elicited messages, textism densities vary widely, but on average appear to be higher in children, ranging from 34% to 59% (Plester, Wood & Bell, 2008; Plester, Wood & Joshi, 2009), compared to a range of 14% (De Jonge & Kemp, 2012) to 53% (Kemp, 2010) in adults. This difference is true also for naturalistic messages (which have been shown to contain fewer textisms than messages elicited in an experimental context, Grace et al., 2012). Textism densities in adults' naturalistic messages have been observed at 5% (Ling & Baron, 2007), 19% (Thurlow & Brown, 2003), and 28% (Drouin & Driver, 2012).

Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, and Plester (2011) analysed the naturalistic messages of British children in Years 4 to 7 (ages 8 to 12) at the beginning and end of the school year and observed differences in textism use across both age and time. Textism densities for each age group/time-point ranged from 7% to 49%, with the percentage of textisms peaking in Year 6. Wood et al. suggest that Year 7 students' references to textism use as being an 'immature' form of language use might account for an average decrease of textism use during the year for the students in that age group. It may be that changes in attitude toward the use of textisms are related to a transition between years at the onset of adolescence for many students moving between Years 6 and 7. It may be that older participants consider textism use less appropriate than younger texters in general, and that textism use is related to the social values held by groups of people at different ages (Taylor & Harper, 2001) and assumptions about age differences in linguistic style more generally (Thurlow & Brown, 2003). While textism densities seems to vary with age across these studies, it is not clear whether textism use

might vary significantly with age within an undergraduate population of adults of different ages.

Rationale and hypotheses

To our knowledge, no previous study has directly investigated change over time in adults' use of textisms in a single setting. To this end, we gathered naturalistic data from four groups of first-year university students over four consecutive years, from 2009 to 2012. We hypothesised that textism use would decrease over time, and specifically, that contractive textisms would decrease, but that expressive textism use would remain stable or increase. On the basis of previous research, we predicted that women would use more textisms than men in general, and more expressive textisms in particular. To see how improvements in technology might be driving change in textism use, we also collected questionnaire data (for 2010, 2011 and 2012) regarding texting behaviour and phone technology, in terms of both hardware (alpha-numeric keypads vs. QWERTY keyboards), and software (single-press vs. multi-press entry). We hypothesised that students using single-press entry systems (with or without predictive software) would use significantly fewer textisms overall, and contractive textisms in particular, than students relying on multi-press entry. We also wanted to know whether participants' attitudes to textism use changed over time, but as mentioned earlier, it was unclear whether the competing experiences of textism use becoming more normalised, and less novel, would lead to more or less acceptance with time. Finally, we explored whether the use of textisms differed with age, and tentatively predicted that younger adults would use more textisms than would older adults.

Material and Methods

Participants

Participants at all four time-points were separate cohorts of first-year Psychology students from a university in South Eastern Australia. All students were native speakers of English. In 2009, there were 133 students (77% female), mean age 22.7 years ($SD = 7.9$); in 2010, there were 86 students (73% female), mean age 22.8 years ($SD = 8.2$); in 2011, there were 135 students (79% female), mean age 22.8 years ($SD = 7.8$), and in 2012, there were 118 students (78% female), mean age 23.3 years ($SD = 8.1$). The study had ethical approval and all students were given course credit for participation and provided informed consent.

Materials

All students provided examples of sent text messages and provided responses to questionnaire items, as explained below.

Naturalistic text messages. Participants were asked to copy down the last five messages that they had sent from their phones and were comfortable sharing (with any personal names replaced by their initial letter). Instructions were to include more messages as necessary to add up to at least 50 words overall, although most participants only needed to provide five messages. Participants were asked to write messages “exactly as they appear on your phone, including punctuation and emoticons”.

Questionnaire data. In 2009, questionnaire items asked for basic demographic information only. In 2010 to 2012, additional items were included to elicit further information, such as how long participants had owned a mobile phone and how many messages they sent each day. From 2010 on, participants also rated how appropriate they thought it was to use textisms in a text message to a friend. Responses were recorded on a

5-point Likert Scale, where 1 = *not at all appropriate* and 5 = *entirely appropriate* (see Appendix).

Procedure

In 2009, 2011 and 2012, students completed tasks privately on paper. In 2010, students completed questionnaires and tasks (including some not reported in this paper) individually or in pairs, in a quiet university room.

Categorisation of textisms. Textism transformation types were categorised according to comparisons with conventional written English, based on schemes used by Thurlow and Brown (2003) and Plester and Wood (2009) and similar to those used by De Jonge and Kemp (2012) and Drouin and Driver (2012). Following Grace et al. (2012), these categories were then divided into ‘contractive’ and ‘expressive’ textisms. As defined above (and summarised in Table 1), contractive textisms involved the omission of characters, whereas expressive textisms involved the addition of characters. We also counted the number of other types of textisms that did not fall into these categories.

If two textisms occurred in the same word, both were counted, following De Jonge and Kemp (2012), Varnhagen et al. (2009), and Grace et al. (2012). For example, *mon* for *Monday* has been transformed in two ways, in that it has been shortened and is missing a capital letter. For each student, contractive and expressive textism proportions were calculated by dividing total number of these transformation types in their messages by the total number of words in their messages. Similarly, a total overall textism proportion was calculated for each student by dividing the combined total contractive, expressive and other textisms by the total number of words in their own set of messages.

Table 1

Textism Types, with Examples, for Each Category of Textisms Included in Each Broader Type

Contractives	Expressives	Other
G-clippings, <i>bein</i> for <i>being</i>	Kisses and hugs, <i>xxoo</i>	Accent stylisations, <i>yar</i> for <i>yes</i>
Single homophones, <i>c</i> for <i>see</i>	Emoticons, ☺, :-Z	Nonstandard spelling, <i>thankx</i> for <i>thanks</i>
Combined homophones, <i>2night</i> for <i>tonight</i>	Extra letters, <i>siiiick</i> for <i>sick</i>	Omitted capitals, <i>bob</i> for <i>Bob</i>
Omitted apostrophes, <i>dont</i> for <i>don't</i>	Extra words, <i>yes yes yes</i>	Extra capitals, <i>HELLO</i> for <i>Hello</i>
Initialisms, <i>idk</i> for <i>I don't know</i>	Extra punctuation, <i>!!!!!!</i> , <i>?!</i>	
Symbols, @ for <i>at</i>		

Results

Changing textism use between cohorts and sex differences

To investigate any change in textism use over time, and sex differences across each sample, textism proportions were compared for males and females for each of the four time-points. Textisms were categorised as contractive, expressive, or other types, and mean proportions and standard error means are shown in Figure 1.

As shown in Figure 1, the highest proportions of total textisms were found in the messages from 2009 and decreased each year for both sexes. While contractive textisms were present in decreasing proportions in males' messages, expressive textisms appeared to increase each year in females' messages. In each year, females used a greater proportion of textisms overall, and expressive textisms in particular, than males. To analyse whether the total proportion and type of textisms changed significantly with year or participant sex, a repeated-measures ANOVA was conducted with two between-subjects variables, Time-

Point (2009, 2010, 2011, 2012) and Sex (Male, Female), and one within-subjects variable, Textism Type (Contractive, Expressive, Other). The Textism Type data were not normally distributed, and so arcsine transformations were made prior to analysis.

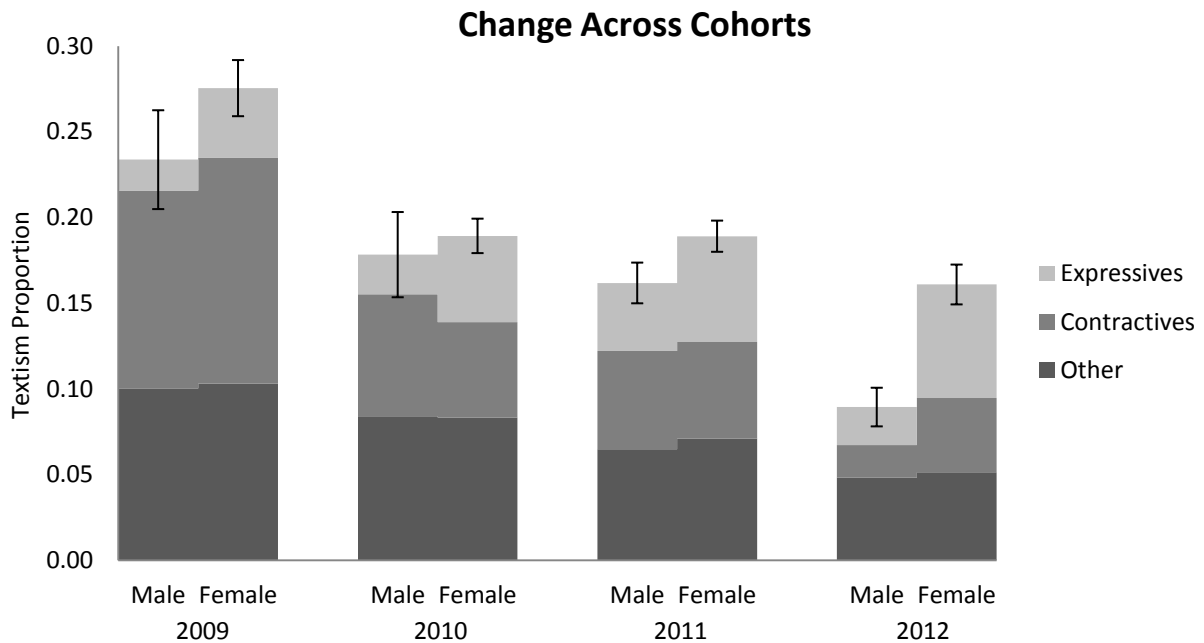


Figure 1

Mean Proportions (and Standard Errors of Total) of Textisms Employed by Males and Females, for Each Year.

There was a significant main effect of Time-Point, $F(3,464) = 12.96, p < .001, \eta^2 = .03$, with Tukey post-hoc tests confirming that textism use decreased significantly from 2009 to 2010 ($p < .05$) and from 2009 to the two subsequent years ($ps < .01$). The decrease in textism use was not significant between 2010 and 2011, but reached significance between 2010 and 2012 ($p < .01$) and between 2011 and 2012 ($p < .001$). A significant main effect was also found for Textism Type, $F(2, 928) = 53.93, p < .001, \eta^2 = .05$. Tukey post-hoc tests confirmed that across the four years, participants produced significantly more ‘other’ textism types than contractives, and significantly more contractives than expressives ($ps < .01$).

A significant interaction between Time-Point and Textism Type, $F(6, 928) = 13.66$, $p < .001$, $\eta^2 = .01$ showed that the types of textisms used differed across the four years.

Tukey post-hoc tests revealed that the proportion of contractive textisms was significantly higher in 2009 than in the three subsequent years: 2010 and 2011 ($ps < .05$) and 2012 ($p < .01$). The proportion of other textisms was significantly higher in 2009 than 2012 ($p < .05$). The increases in the use of expressive textisms across time did not reach significance. The patterns within years changed as well. In 2009 the proportion of contractives and of other textisms was significantly greater than the proportion of expressives ($ps < .01$), and in 2010 the proportion of other textisms was significantly greater than of expressives ($ps < .05$). In 2011 and 2012, the use of the three textism types no longer differed significantly.

A significant effect of Sex, $F(1, 464) = 17.46$, $p < .001$, $\eta^2 = .04$, confirmed that females used significantly more textisms overall than males. This was qualified by a significant interaction between Textism Type and Sex, $F(2, 928) = 13.15$, $p = .001$, $\eta^2 = .01$. Tukey post-hoc tests confirmed that males and females did not differ significantly in their use of contractive or other textisms, but that females used a significantly higher proportion of expressive textisms than males ($p < .01$).

Texting behaviour and phone technology

Data regarding attitudes towards textism use and phone use were collected for 2010, 2011 and 2012. Some of the data from 2010 were reported in a previous study (Grace et al., 2012); however, here we compare results across time-points. Table 2 displays phone ownership, message sending rates and ratings of the appropriateness of textism use.

Table 2

Means (with Standard Deviations) for Phone Use and Ratings for the Appropriateness of Textism Use.

	2010	2011	2012
Years owned phone, overall	7.13 (2.44)	7.40 (2.39)	8.11 (2.98)
<i>Males</i>	7.91 (2.37)	7.43 (2.62)	7.96 (2.76)
<i>Females</i>	6.84 (2.42)	7.40 (2.33)	8.16 (3.06)
No. msgs sent daily, overall	23.94 (31.90)	23.99 (26.52)	25.91 (37.36)
<i>Males</i>	29.91 (47.15)	17.30 (22.22)	34.19 (60.04)
<i>Females</i>	21.75 (24.25)	25.91 (27.43)	23.54 (27.79)
Appropriateness ratings, overall	4.48 (0.86)	4.50 (0.87)	4.42 (0.81)
<i>Males</i>	4.52 (1.08)	4.43 (1.01)	4.46 (0.86)
<i>Females</i>	4.46 (0.78)	4.51 (0.83)	4.41 (0.80)

Table 2 shows that, over time, there has been a gradual increase in the average years of phone ownership (indicating that students have acquired their first phones at slightly younger ages) and in students' daily message sending rates. Pearson correlations (calculated overall and for each year) revealed that length of phone ownership was not significantly related to total textisms in participants' messages. However, as length of phone ownership increased, proportions of contractive textisms increased ($r = .21, p < .001$), other textisms decreased ($r = -.16, p < .01$), and there was no significant link with expressive textisms, although the relationship was a negative one ($r = -.09, p = .08$). Mean daily sending rates and students' opinions regarding the appropriateness of using textisms in messages to friends differed little between 2010 and 2012, and one-way ANOVAs revealed no significant differences across time for either factor.

Questionnaire responses also included items regarding the hardware (touchscreen or keyboard versus alpha-numeric keypad) on participants' phones, and the software (e.g.,

predictive software versus multi-press text entry) that participants used most of the time (specifically, more than 50% of the time), as reported in Table 3.

Table 3

Percentages of Students Using Each Text Entry System in Each Year.

	2010	2011	2012
Hardware use: Alpha-numeric, overall	53.5	21.5	10.2
<i>Males</i>	69.6	23.3	11.5
<i>Females</i>	47.6	21.0	9.8
Full keyboard, overall	46.5	77.0	83.1
<i>Males</i>	30.4	76.7	84.6
<i>Females</i>	52.4	77.1	82.6
Use both, overall	0.0	1.5	6.8
<i>Males</i>	0.0	0.0	3.8
<i>Females</i>	0.0	1.9	7.6
Software use: SP predictive, overall*	54.7	55.2	65.5
<i>Males</i>	47.8	65.5	62.5
<i>Females</i>	57.1	53.4	67.8
SP non-predictive, overall	31.4	35.1	27.6
<i>Males</i>	21.7	20.7	33.3
<i>Females</i>	34.9	39.8	26.7
Multi-press, overall	14.0	8.2	5.2
<i>Males</i>	30.4	13.8	4.2
<i>Females</i>	7.9	6.8	5.6

Note: Some percentages do not add to 100 due to rounding and the exclusion of four students who selected software options equally.

*SP = Single-press. Predictive technology allows for single-press text entry on phones with alpha-numeric keypads and full keyboards alike.

As reported in Table 3, participants' use of phone hardware and software varied with both sex and cohort. However Pearson Chi squared calculations showed that none of the differences between males and females' use of either Hardware or Software were

statistically significant for any of the comparisons. Participants' use of phone hardware changed between 2010 and 2012, with more students using full keyboards 'most of the time' in 2011 and 2012 than in 2010. The use of phone software also changed, with fewer students using multi-press text entry most of the time in 2012 than in previous samples. Pearson Chi squared calculations revealed significant effects of Time-Point (2010, 2011, 2012) on students' choice of Hardware Type (Alpha-numeric Keypad, Full Keyboard/Touchscreen), $n = 335$, $\chi^2(2) = 47.46$, $p < .001$, statistically confirming the gradual replacement of alphanumeric keypads with QWERTY keyboards/screens. However, there was no effect of Time-Point on students' choice of Software Type (Predictive, Non-predictive), $n = 303$, $\chi^2(8) = 8.70$, $p = .37$ (participants employing multi-press keyboards or combined hardware or software were excluded due to small group sizes). Pearson Chi squared calculations comparing males and females in each year revealed no significant sex differences for measures of participants' texting experience (phone ownership and daily sent messages), appropriateness ratings, or phone technology (hardware or software, with exclusions as above).

Effects of technology on textism use

Changes in the availability and use of full keyboards and predictive software (especially in contrast to using multiple key presses to enter text) may have an effect on the proportion of textisms that texters employ in their messages, as reported in Figures 2 and 3. Data for phone technology were collected for 2010 to 2012 only and the ten participants whose phones incorporated both hardware types were excluded, as above.

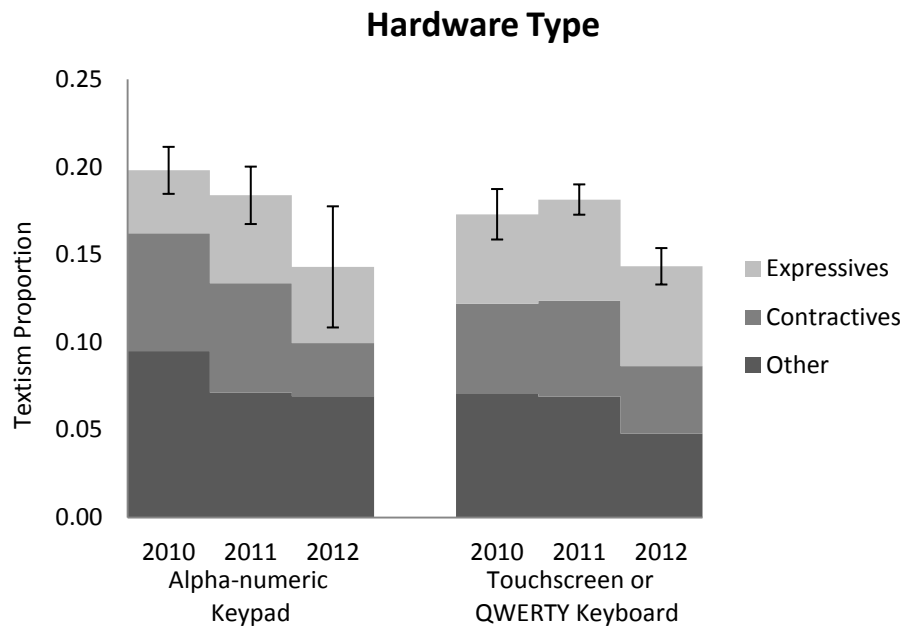


Figure 2

Mean Proportions (and Standard Errors of Total) of Textism Types Employed across Hardware Entry System and Year.

As shown in Figure 2, while textism use generally decreased over time for both Hardware Types, this decrease was fairly similar for both users of alpha-numeric keypads and full keyboards/touchscreens. Independent *t*-tests comparing the two hardware types were conducted for textism use in each year and overall. These showed that textism use was significantly higher for users of alpha-numeric keypads than users of full keyboards and touchscreens in 2010 only, and even then only for expressive textisms, $t(84) = 2.66, p < .01$, and for other textisms $t(84) = 2.55, p < .05$. As so few differences were statistically significant, and the constraints of alpha-numeric keypads are mediated by the use of predictive software, effects of Hardware Type were not analysed further.

Participants who predominantly used single-press entry systems used fewer textisms overall than participants reliant on multi-press text entry, as shown in Figure 3.

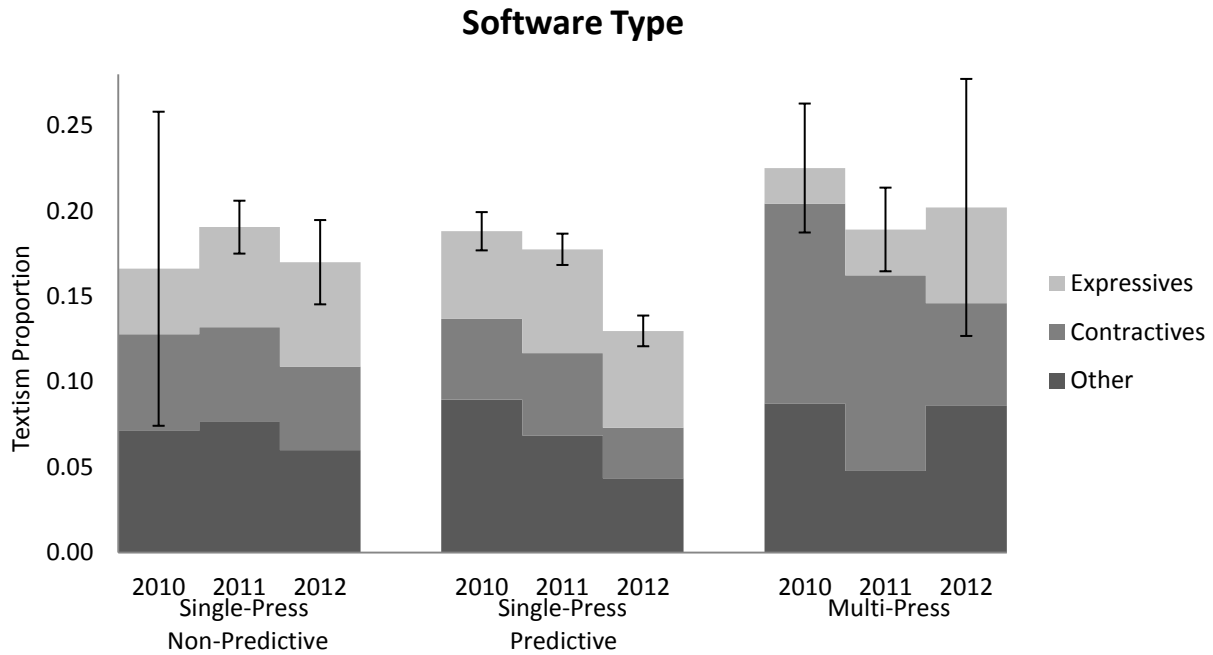


Figure 3

Mean Proportions (and Standard Errors of Total) of Textism Types Employed across Software Entry System and Year.

The messages of participants who used multi-press entry most of the time included higher proportions of contractive textisms and lower proportions of expressive textisms than the messages of alternative entry methods. However, group size was very small for multi-press users ($n = 12$ in 2010, $n = 11$ in 2011, $n = 6$ in 2012). For this reason, data were combined across all years and a repeated-measures ANOVA was conducted with one between-subjects variable, Software Type (Predictive, Non-predictive, Multi-press), and one within-subjects variable, Textism Type (Contractive, Expressive, Other). There was a significant main effect of Textism Type, $F(2, 658) = 15.70$, $p < .001$, $\eta^2 = .05$, which was subsumed by a significant interaction between Textism Type and Software Type, $F(4, 658) = 10.51$, $p < .001$, $\eta^2 = .06$. Tukey post-hoc tests confirmed that proportions of contractive textisms were significantly higher in messages written in multi-press than single-press non-predictive systems ($ps < .01$), which in turn were higher than in single-press predictive systems ($p < .05$). In contrast, proportions of expressive textisms were significantly lower

in messages written in multi-press than in either non-predictive or predictive single-press systems ($ps < .01$). Post-hocs further confirmed that multi-press users produced significantly more contractives than other textisms, and more other than expressive textisms ($ps < .01$). In contrast, users of single-press software, both predictive and non-predictive, produced significantly more other textisms than either expressives or contractives ($p < .05$), and users of predictive technology (only) produced more expressives than contractives ($p < .01$).

Participant age and the use of textisms, texting and phone technology

To investigate the relationship, if any, between age and overall textism use, a series of Pearson coefficient correlations were calculated on these two variables, as shown in Table 4.

Table 4

Pearson Coefficient Correlation r-Values for Relationships Between Participant Age and Textism Use

	2009	2010	2011	2012	Overall
Overall	.11	-.11	.14	-.05	.03
Contractives	.22*	.23*	.40***	.24**	.24***
Expressives	-.11	-.38***	-.31***	-.22*	-.24***
Other	-.02	-.35**	-.19*	-.11	-.14**

* $p < .05$, ** $p < .01$, *** $p < .001$

As Table 4 shows, correlations with age were not significant for overall textism use. However, correlations were significant when textism type was considered: the use of contractive textisms increased with increasing age, whereas the use of expressive and other textisms decreased with increasing age. Survey data were then examined to consider whether differences in texting experience, attitudes towards textism use, or phone technology might explain these effects. A further series of correlations showed that as

participant age increased, mean messages sent per day decreased ($r = -.34, p < .001$) and that as daily sent messages decreased, proportions of contractive textisms increased ($r = -.18, p = .001$) and expressive textisms decreased ($r = .21, p < .001$), while use of other textisms was not significantly related ($r = -.02, p = .71$). Correlations also showed that as participant age increased, mean length of phone ownership increased ($r = .59, p < .001$), which was noted above to be associated with higher proportions of contractive textisms and a decrease of other types. Therefore, factors of texting experience may at least partially explain age differences in textism use. Participants' ratings of the appropriateness of using textisms were not significantly related to their age, although the direction of the relationship was for students to rate textism use as less appropriate with increasing age ($r = -0.10, p = .08$).

A one-way ANOVA showed that age differed with Hardware Type (Alpha-numeric Keypad, QWERTY keyboard), $F(1, 328) = 5.11, p = .02$, confirming that participants using alpha-numeric keypads ($M = 24.59$ years, $SD = 9.89$) were significantly older than users of QWERTY keyboards ($M = 22.34$ years, $SD = 7.12$). Finally, a one-way ANOVA also confirmed that age differed with Software Type (Predictive, Non-predictive, Multi-press), $F(2, 331) = 11.3, p < .001$. Tukey post-hoc tests confirmed that the average age of multi-press text entry system users was significantly higher ($M = 29.48$ years) than the average age of users of either single-press non-predictive systems ($M = 22.88$ years, $p < .001$) or single-press predictive systems ($M = 22.09, p < .001$), which did not differ significantly.

Discussion

The use of textisms in text messages may be influenced by a number of factors. In this study, we investigated whether textism use was changing over time, and whether it differed according to participants' sex and age, and/or with texting experience, attitudes

and the text entry systems used. As hypothesised, we observed a significant and fairly steady decrease in overall textism use from 2009 to 2012. More specifically, we saw a decrease over time in the use of contractive textisms; the stereotypical shortened words of texting, such as *wen* for *when*, as well as of miscellaneous other textisms such as omitted capitals and non-standard spellings. In contrast, the mean proportions of expressive textisms (involving extra characters, e.g., *yesss!! ☺*) did not decrease significantly over time, and indeed showed a slight but non-significant increase. The decrease of contractive and other textisms in messages might be due to changes in attitudes towards textism use, changing phone technology, or other factors, as discussed below.

Most previous research has established greater textism use by females than males (e.g., Herring & Zelenkauskaite, 2008; Rosen et al., 2010; Tossell et al., 2012). In line with these findings, females in our study used significantly higher proportions of textisms than males overall, and of expressive textisms in particular, as predicted. However, unlike in previous research, no significant differences were found between males' and females' use of phone hardware or software (compare Baron & Ling, 2010; Ling, 2007), ratings of the appropriateness of using textisms in messages, or message sending rates (compare Grace et al., 2012; Herring & Zelenkauskaite, 2008). If females' greater use of expressive textisms is not linked to measures of texting experience or uptake of phone technology, it may reflect wider social and psychological reasons for women to express emotion with greater freedom than men generally (Brody & Hall, 1993), and therefore within their text messages. It may be that norms within texting culture reflect these wider social norms accordingly.

The changes in textism use we saw over time and between males and females might be due to a number of factors. One factor that we investigated was the potential for people's attitudes towards textism use to have changed over time. However, ratings of the

appropriateness of using textisms in messages were not only very similar between males and females, but also across each time-point in which they were measured (2010 to 2012). Predictably, there was a slight increase in length of phone ownership across time (indicating that later students received their first phones at a younger age). Length of phone ownership (like the progression of time-point across the four years) was associated with higher proportions of contractive textisms and lower proportions of other textism types. While differences in technology may not explain the sex differences in our sample, questionnaire data revealed that participants' use of phone technology had changed substantially between 2010 and 2012, and as now discussed, the effects of technology are likely to provide the best explanation for the changes in textism use seen over time.

In terms of phone hardware, the use of QWERTY keyboards is clearly superseding the use of earlier alpha-numeric keypads. However, textism use did not differ significantly according to the hardware in use on students' phones. The lack of significant effects of hardware may be due to the overriding effects of predictive texting software, which largely negates the constraints of alpha-numeric keypads by allowing texters to use single key-presses to create words, thereby alleviating pressure to abbreviate words (Crystal, 2008). Participants' use of phone software changed between 2010 and 2012, with significantly fewer participants relying on multi-press entry in 2012 than 2010, and a reciprocal increase in reliance on predictive technology. Use of predictive texting was lower in this study (55% to 65%) than other studies involving undergraduates (72% in Kemp, 2010; 86% in De Jonge & Kemp, 2012). As predicted, software use and textism use were shown to be related. Participants who used multi-press entry systems more than half of the time used significantly more contractive textisms, and significantly fewer expressive textisms, than single-press, predictive software users. Thus, changes in phone technology may explain changing proportions of textism types seen across the four time-points. Specifically,

developments that overcome the effort required by multi-press systems with predictive technology and the inclusion of full keyboards on modern phones have freed texters to express themselves without concern for minimising character use. However, it should also be borne in mind that texters may choose technology that best fits the style of writing they employ in creating messages.

We were interested in potential effects of participants' age, but found that there was no significant relationship between age and overall textism use. This is in line with our finding that participants' attitudes towards the appropriateness of textism use did not vary significantly with age (although the direction of the relationship was for older participants to find textism use to be less appropriate than younger participants). However, a striking finding was revealed when we considered the use of the three types of textisms separately. Participant age correlated significantly and positively with proportion of contractive textisms produced, but significantly and negatively with proportions of expressive textisms, as well as with other textism types. Thus, older participants were more likely to create shorter versions of words (e.g., *pls* for *please*), and less likely to insert letters for expressive effect (e.g., *pleeease?!*) than younger participants.

A technology-based explanation for these patterns of association between age and textism use seems likely. Some older participants may have developed their texting style while alpha-numeric keypads and further constraints such as high message costs and 160-character limits per message dominated texting language expectations. Participant age was also significantly associated with longer phone ownership and lower message sending rates: older people had owned their phones for longer, but texted less often, than younger people. The average age of those who used multi-press text-entry was also older than single-press text-entry, whether predictive or non-predictive. Longer phone ownership, lower message sending frequency, and multi-press text-entry were similarly associated

with higher proportions of contractive textisms and lower proportions of expressive and/or other textisms. Therefore it is likely that the phone technology in use on participants' phones is the main reason for differences in textism use across participant age.

In conclusion, measures of texting experience (length of phone ownership and average daily sent messages) and attitudes (ratings of the appropriateness of using textisms) seemed to have only limited association with changes in textism use over time. Changes in technology over time were more marked, with younger students tending to use newer single-press key entry systems than older students, and significantly more students using predictive software over time. It may be that improvements in mobile phone technology are leading to a shift away from contractive textism types, in both individuals and wider social groups. Conversely, changes in phone technology may even be facilitating the use of expressive textisms via the inclusion of full QWERTY keyboards, larger screens and more or unlimited character allowances per (concatenated) message. This is interesting in light of previous media concerns regarding the highly abbreviated nature of text language (see Thurlow, 2006, for a review). The possibility that the use of contractive and expressive textism types in text messaging is changing in opposing directions underlines the importance of examining these types separately. The consideration of only the proportion of total textisms masks the potential shift away from abbreviation and towards communicative expression in text messaging observed here. Textisms that use extra letters to represent tone of voice (e.g., *pleeease* for *please*), emoticons to represent facial expressions (e.g., :o), ☺) and extra punctuation to represent emotion (e.g., *yes!!!!*) all have the potential to enhance the communicative value of messages (Shortis, 2007). It is important that longitudinal studies continue to examine this shift in textism use as text-entry technology continues to develop.

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Appendix

Text messaging questionnaire

Age: _____ years and _____ months

Sex: Male Female

Is English your first language? Yes No **If No:** What is your first language? _____

Do you always send and receive messages in English? Yes No

If No: What percent of the time do you **send** _____% and **receive** _____%

text messages in English? What other languages do you text in? _____

1. How long have you owned a mobile phone? _____ months OR _____ years

2. How often do you usually send or receive text messages? On average, about:

Send: _____ messages per day **Receive:** _____ messages per day

3. What type of keypad does your phone have?

☐ Alpha-numeric keypad (with letters written above number keys like on a landline phone)

☐ Qwerty keypad (like a computer keyboard)

☐ Touch-screen keypad (with separate touch-screens for numbers/letters/symbols)

☐ Other (please explain) _____

4. About what percent of the time do you use each of the following text entry systems? % of the time

Single-press predictive (press each key once and phone predicts likely word) _____

Single-press non-predictive (press each key once without needing/using prediction) _____

Multi-press (press each number key 1 to 4 times for the right letter) _____

Other (please explain) _____

5. Which statement best describes the way that you **write** text messages? Tick one.

I use abbreviations and “text message” style spellings for...

☐ Most of the words that I write.

☐ Only some of the words, such as “u” for “you”.

☐ Nothing at all; I try to write all my words in conventional English.

6. Which statement best describes the way you feel when you **read** text messages? Tick one.

When I read a text message that is full of abbreviations and “text message” spellings...

- ☐ I find it easy to work out what the sender meant.
- ☐ I know the obvious abbreviations, but I sometimes struggle with the more obscure ones.
- ☐ I find it difficult to work out many of the abbreviations.

7. How **appropriate** do you think it is to use text-message-style abbreviations in each of the following type of message? (e.g., “u” for *you*, “lol” for *laughing out loud*, smiley faces)

Texting a friend: Not at all appropriate 1 2 3 4 5 Entirely appropriate

[*Other appropriateness items are not analysed in this paper.*]

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Undergraduates' Text Messaging Language and Literacy Skills

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Abstract

Research investigating whether people's literacy skill is being affected by the use of text messaging language has produced largely positive results for children, but mixed results for young adults. We asked 150 undergraduate university students in Western Canada and 86 in South Eastern Australia to supply naturalistic text messages and to complete nonword reading and spelling tasks. The Australian students also completed two further real word and nonword reading tasks, a spoonerisms task, a questionnaire regarding their reading history, and a nonverbal reasoning task. We found few significant correlations between literacy scores and both use of *textisms* (such as *u* for *you*) and measures of texting experience, but those that reached significance were mostly negative. Australian students who thought that using textisms was more appropriate had poorer nonword reading and reported having had more difficulty learning to read, than those who found it less appropriate. We conclude that there is inconsistent evidence for negative relationships between adults' use of textisms and their literacy skills, and that these associations may be influenced by attitudes towards the appropriateness of textism use. A model of the potential relationship between adults' textism use and literacy skills is presented.

Keywords: *Text-messaging, adults, literacy*

Undergraduates' Text Messaging Language and Literacy Skills

Text messaging by mobile phone is a method of written communication that continues to increase in popularity, with close to 200,000 messages being sent per second globally (International Telecommunication Union, 2010). The written language of text messages is often characterised by the use of *textisms*: abbreviations and other re-spellings, such as 2 for *to*, or *nite* for *night*. Concerns have been voiced in popular news media that increased use of such text language is negatively influencing texters' formal literacy skills, not only in English (Humphrys, 2007; Thurlow, 2006; Woronoff, 2007), but also in other languages (e.g., Anis, 2007; Tseliga, 2007). Empirical studies have confirmed that exposure to incorrectly spelled words can negatively influence both adults' and children's spelling of those words (Burt & Long, 2011; Dixon & Kaminska, 1997). However, this negative effect does not appear to extend to exposure to textism-like spellings: Powell and Dixon (2011) showed that adults were better at spelling words after exposure to either correct or textism-like versions of those words than after exposure to incorrectly spelled versions.

Many researchers hold a positive view of texting, highlighting the creativity and expressive opportunities that it affords (e.g., Crystal, 2008; Shortis, 2007; Tagliamonte & Denis, 2008). Empirical research has supported this optimistic view, at least for children. Studies have consistently shown positive links between children's literacy scores and texting behaviours, in both the United Kingdom (e.g., Coe & Oakhill, 2011; Neville, 2003; Plester, Wood, & Joshi, 2009) and Australia (Kemp & Bushnell, 2011). There are several possible explanations for these positive relationships. Children with stronger reading and writing skills may be better at word play and more capable of representing letter-sound correspondences using unconventional spelling (Neville, 2003; Plester & Wood, 2009).

The use of textisms may also demonstrate linguistic awareness in a broader sense (Crystal, 2008); for example, by indicating pronunciation (e.g., *wanna* for *want to*), intonation (e.g., *pleeease* for *please*), pause-fillers (e.g., *umm...*), and non-verbal additions (e.g., smiley faces, kisses, and extra punctuation). Younger texters' sensitivity to linguistic differences between social groups may also be seen in their tendency to use textisms that signal group membership (Green, 2003; Lewis & Fabos, 2005).

In highly literate adults, however, we might expect any relationship between textism use and literacy to be relatively limited. For example, it is likely that most educated adults have sufficient literacy skills to learn, create and/or decipher textisms based on correspondences between letters/numbers and their sounds (such as *skool* for *school*, *2day* for *today*). Further, adults' ability to indicate prosodic or non-verbal aspects of language in their text-messaging (e.g., extra punctuation such as ... or ??!!, emoticons such as ☺; Herring & Zelenkauskaitė, 2009) is likely to be greater than that of children. Conversely, the desire of adult texters to fill their messages with abbreviations or symbols may be less strong than that of children, as textism use may be associated with perceived immaturity for some adults (Lewis & Fabos, 2005). Less textism use overall would limit potential relationships between textism use and literacy scores.

The handful of results concerning the relationship between texting and literacy in older participants has been less than consistent. Earlier work asked participants to report on their own text-messaging behaviour, which is a method that relies on the inherently difficult task of accurately estimating one's own previous texting rates and/or textism use. Massengill Shaw, Carlson, and Waxman (2007) found no significant relationship between the self-reported frequency of sending text messages and the spelling scores of 86 university students in the United States of America (US). No information was collected on participants' use of textisms. In a study of 152 US university students, Drouin (2011)

found a positive correlation between self-reported frequency of sending text messages and scores on tests of spelling and reading fluency. However, she found negative relationships between students' reading accuracy and their self-reported textism use on both social networking sites and in emails to professors. Drouin and Driver (2012) examined the naturalistic text messages of 183 undergraduates in the US, and found that poorer scores for reading and spelling (but not for reading fluency or vocabulary) were associated with significantly greater textism use overall. Finally, mixed results were also seen in a study of 718 young US adults who provided information about their use of texting and textisms, as well as samples of formal and informal writing (Rosen, Chang, Erwin, Carrier, & Cheever, 2010). There were negative associations between self-reported use of textisms and formal writing skill, but only in individuals with no or incomplete tertiary education. However, there were positive associations between self-reported use of textisms and informal writing skill for all participants. Each of these studies was completed in the US, but there is evidence (e.g., Baron & Campbell, 2010; Grace, Kemp, Martin, & Parrila, 2012) that texting and textism use differ between countries, and these differences may affect any links between literacy task scores and texting and textism use.

Other studies have considered adults' use of textisms in an experimental setting. Kemp (2010) asked 61 Australian university students to read and write (to dictation) text messages using text language and conventional English. Controlling for number of messages usually sent per day, she found that higher scores on standardised tasks of real-word reading and spelling were correlated with faster and more accurate reading and writing of both types of messages. However, there was no significant relationship between the use of textisms and literacy scores. De Jonge and Kemp (2012) found a different pattern of results in Australian high school ($n = 52$) and undergraduate ($n = 53$) students, who also translated conventional English passages into text language. Negative

correlations were seen between the number of years that individuals had been texting, and their real-word and nonword reading scores, and between their text message sending frequency and their spelling, real-word reading, and nonword reading scores. Further, once texting frequency was controlled, there was a significant negative correlation between participants' use of textisms in the dictated messages, and their scores on nonword reading. Recent research (Grace et al., 2012) suggests that asking people to write text messages to dictation in an experimental setting (as in the two studies just discussed) can lead participants to use more textisms than they do in real life. Thus, it is important to investigate the links between literacy and the actual use of textisms in adult texters' naturalistic messages.

Only a few studies have examined students' opinions of textism use. Lewandowski and Harrington (2006) showed that undergraduates perceived the use of textisms in a student's formal email as indicating that the writer was less skilled, and had made less effort, than the writer of an email written without textisms. Drouin (2011) found that undergraduates considered it inappropriate to use textisms in emails to professors, but appropriate when writing to friends, whether by text or email. Similarly, Drouin and Davis (2009) report that 75% of students believe that using textisms is appropriate in informal communication. The number of textisms undergraduates use in their naturalistic messages has been shown to be positively related to their opinions regarding textism use (Grace et al., 2012), but it has not been established whether these opinions are also related to participants' literacy skills. For example, it may be that students who have a history of finding conventional spelling more difficult are more likely to use unconventional spelling forms in their messages. Varying opinions regarding the value of textism use may contribute to the complexity of establishing clear links between textism use and literacy skill in adults.

In sum, previous studies have shown consistently positive correlations between children's use of text language and their performance on literacy tasks, but varied results for adults. Results showing textism use to be unrelated or negatively related to adults' literacy skills may be at least partially attributable to possible ceiling effects in the literacy skills of university student participants. However, social factors might also affect textism use, beyond any differences in reading and writing ability. As noted earlier, although textisms might signal important social groupings for many younger texters (Lewis & Fabos, 2005), many young adults no longer find it socially important to include abbreviated forms (Tagliamonte & Denis, 2008). Pressure on university students to be seen as academically capable may also limit the use of textisms.

In the present studies, we investigated the links between the naturalistic texting behaviour and the literacy skills of students in two English-speaking countries, Canada and Australia. Specifically, we examined links between participants' reading, spelling, and phonological skills and their use of textisms in their everyday text messages. To our knowledge, this is the first empirical research to compare literacy skills with adult participants' actual use of textisms, rather than their self-reported or experimentally elicited textism use. In line with previous research, we also investigated links with participants' text messaging experience (length of phone ownership and daily message sending rates), and their opinions regarding the appropriateness of textism use.

Based on the results of previous studies and the generally good literacy skills of university students, we hypothesised that students' literacy scores would not be significantly correlated with their naturalistic textism use, nor with measures of texting experience. We know that students who rate textism use as less appropriate use fewer textisms in their messages (Grace et al., 2012), but we did not have sufficient data from which to predict whether literacy scores and appropriateness ratings would also be related.

Study 3.1

In this study, we investigated links between naturalistic textism use and scores on two standardised literacy-based tasks: a nonword reading task, and a real-word spelling task, in a sample of Canadian students. The ability to read an unfamiliar or novel word depends on the individual's ability to decode the sounds of the letters and letter combinations, and a test specifically targeting phonological decoding skills can reveal individuals' difficulties that are not readily apparent in an adult population (Elbro, Nielsen, & Petersen, 1994; Gallagher, Laxon, Armstrong, & Frith, 1996). Tests of spelling skills also have the potential to reveal individual differences in university populations (Kemp, Parrila, & Kirby, 2008). Real-word spelling is the skill that has most often been tested in previous research on links between literacy and textism use, in both adults and children (e.g., Kemp, 2010; Massengill Shaw et al., 2007; Plester, Wood & Bell, 2008). Thus, we also included a real-word spelling task. As noted above, social constraints on the use of textisms in young adults, and a relatively limited range of variation in the literacy skills of university students, led us to hypothesise that any relationship between naturalistic textism use and either nonword reading or real-word spelling would not be significant.

Method

Participants. Participants were 150 first-year students (116 female) taking an Educational Psychology class in an urban university in Western Canada, with a mean age of 22.5 years ($SD = 4.2$ years). The high proportion of females compared to males is representative of both cohorts. These students were part of a larger study (completed in late 2010) for which they were given course credit for participation and provided informed consent. All participants were native speakers of English. The study had ethical approval from the university.

Materials and procedure. Participants provided samples of their recently sent text messages, filled in a short questionnaire, and completed two literacy tasks. These tasks were done individually or in pairs in a single session of 30-40 minutes, in a quiet university room.

1. ***Text messaging naturalistic task.*** Participants were asked to copy down the last five messages they had sent from their phones, including more messages as necessary to add up to at least 50 words overall. Participants were asked to write messages “exactly as they appear on your phone, including punctuation and emoticons”.
2. ***Questionnaire data.*** Participants completed a questionnaire regarding demographic and texting data; in this paper we report length of phone ownership and daily sent messages as measures of texting experience. Participants also rated how appropriate they thought it was to use textisms in a text message to a friend. Responses were recorded on a 5-point Likert scale (1 = not at all appropriate and 5 = entirely appropriate).
3. ***Nonword Reading.*** The Nonword Reading Test (Martin & Pratt, 2001) is a standardised test in which students read aloud a list of 54 nonwords of increasing difficulty. Although many university students can read most of these words accurately given unlimited time, the addition of time pressure is assumed to identify individual performance differences (Deacon, Parrila, & Kirby, 2006). Therefore we presented this task in two stages. First, we measured students’ Timed Nonword Reading score: the number of nonwords they could read aloud in 30 seconds without compromising accuracy. Second, we measured Total Nonword Reading score, by asking students to continue reading to the end of the nonwords in their own time, re-reading any items read

inaccurately in the first 30 seconds. Words were printed on a single sheet of paper (rather than in the standard booklet form) to control for individual differences in page-turning time encountered in pilot testing. Standard scores were calculated from the raw scores for both the timed and total stages, but these scores should be interpreted with caution, as the task is not timed in the standard administration.

4. **WRAT Spelling.** Participants were administered the spelling subtest of the Wide Range Achievement Test, Fourth Edition (WRAT-IV; Wilkinson & Robertson, 2006), a standardised test in which students spell 42 dictated words of increasing difficulty.

Categorisation of textisms. The textisms observed in each text message were categorised according to the type of transformation that was made from the conventional word, using categories employed in several previous studies (e.g., De Jonge & Kemp, 2012; Plester et al., 2009; Thurlow & Brown, 2003) as listed in Table 1.

Each transformation was counted, even when more than one appeared in a word, to capture the full detail of textism types used (following De Jonge & Kemp, 2012; Varnhagen et al., 2009). For example, *im* for *I'm* was counted in both the categories *omitted capitals* and *omitted apostrophes*. Textism density, in terms of proportion of transformations, was calculated by dividing the number of transformations in students' total messages by the number of words in their total messages for each student.

Table 1

Categorisations Applied to Textism Transformations

Category	Example
Homophones	<i>b</i> for <i>be</i> , <i>gr8</i> for <i>great</i>
Shortenings	<i>Tue</i> for <i>Tuesday</i>
Contractions	<i>pls</i> for <i>please</i>
Omitted apostrophes	<i>wont</i> for <i>won't</i>
g-clippings	<i>havin</i> for <i>having</i>
Initialisms	<i>brb</i> for <i>be right back</i>
Nonstandard spelling	<i>awsum</i> for <i>awesome</i>
Youth stylisation	<i>kinda</i> for <i>kind of</i>
Symbols	<i>&</i> for <i>and</i> , <i>xx</i> , <i>☺</i>
Omitted capitals	<i>bob</i> for <i>Bob</i>
Extra capitals	<i>WHAT</i>
Extra punctuation	<i>!?! ,</i>
Extra letters	<i>hellooo</i> for <i>hello</i>
Extra words	<i>love love</i>
Other textisms	<i>atall</i> for <i>at all</i>

Results and Discussion

Participants' naturalistic text messages, questionnaire data and literacy scores were collated and textisms were categorised as described above. The students' naturalistic text messages contained a mean textism density of .16 textisms per message ($SD = .09$).

Participants had owned a mobile phone for an average of 6.0 years ($SD = 2.3$), and sent an average of 39.8 messages per day ($SD = 44.5$). (The data for one outlier who reported sending 1000 messages per day were excluded from analyses of this factor.) Likert ratings for the appropriateness of using textisms in a message to a friend averaged 4.6 ($SD = 0.8$), that is, close to 5, *entirely appropriate*. Table 2 shows descriptive data for the literacy task scores, which were within the normal range.

Table 2

Means for Literacy Task Standard Scores (Standard Deviations in parentheses)

	M	(SD)
Timed Nonword Reading	90.5	(10.9)
Total Nonword Reading	115.4	(11.4)
WRAT Spelling	106.6	(9.4)

Table 3 shows Pearson correlations between literacy scores and the measures associated with texting: specifically, the proportions of textisms in individual participants' naturalistic messages, number of years of phone ownership, number of messages sent per day, and perceived appropriateness of the use of textisms in messages to friends.

Table 3

Correlations (r-values) Between Task Scores, Textism Use, Length of Phone Ownership, Daily Sent Messages and Ratings of the Appropriateness of Textism Use, for Canadian Participants

Variables	1	2	3	4	5	6
1. Timed Nonword Reading						
2. Total Nonword Reading	.51**					
3. WRAT Spelling	.26**	.29**				
4. Textism Use	.03	-.16	-.19*			
5. Length of Ownership	-.15	.01	-.16*	-.16		
6. Daily Sent Messages	.07	-.03	.02	.11	-.07	
7. Appropriateness Ratings	.04	.00	-.01	.27**	.04	.08

* $p < .05$, ** $p < .01$

As shown in Table 3, only weak correlations were observed between texting-related measures and literacy scores, and few reached significance. There were no significant correlations between reading scores and texting-related measures, but WRAT spelling scores correlated significantly and negatively with both textism use and number of

years of phone ownership. Specifically, students with lower spelling scores used more textisms in their messages, and had owned phones longer, than those with higher spelling scores. No significant correlations were observed between literacy scores and either daily sending rates or appropriateness ratings. However, participants' appropriateness ratings were significantly and positively related to their textism use (in that the more appropriate they believed textism use to be, the more textisms they used in their messages), but not to message-sending frequency or length of experience.

To further investigate the relationship between textism use and literacy scores, we conducted a multiple regression based on the one significant correlation; between density of textisms in naturalistic messages and WRAT spelling scores. In the first model, the predictors were mean number of sent messages and textism appropriateness ratings. These factors did not explain a significant amount of variance in spelling scores, but the second model, in which textism use was added, did reach significance, *Adjusted R² Change* = .04, *F Change* (1,145) = 5.35, *p* = .02. Thus, textism use was the only predictor to explain a significant amount of variance in WRAT spelling scores, *beta* = -.20, *p* = .02, even when text messaging experience and social attitudes (appropriateness ratings) were taken into account.

Study 3.2

To further investigate links between textism use and undergraduates' literacy skills, we then considered a similar population of English-speaking undergraduates in Australia. In light of inconsistent previous results across different literacy tasks, we also wanted to expand the set of tasks to include a wider range of literacy skills. These included the reading of real words, another test of nonword reading, and a specific test of phonological processing (Spoonerisms). Real-word reading provides a broader measure of participants' reading exposure, word knowledge and vocabulary. In Study 3.1, we had used the

Nonword Reading Test in a way that varied from the standard administration, and thus caution was required in interpreting the results. For this reason, in Study 3.2 we included a second standardised test of nonword reading. We also added a Spoonerisms task that explicitly tests the ability to decipher and manipulate the phonological structure of words. Phonological skills are not reliant on accurate knowledge of orthographic spelling rules, but are required to read and create many textisms (e.g., *wot* for *what*, *2nite* for *tonight*; Plester et al., 2009). Finally, we obtained questionnaire data about whether individuals had experienced difficulty in learning to read and write at school. A history of negative experiences with reading and writing words might lead to lower motivation to strive for correct spellings when they are not essential, for example, in writing text messages.

Method

Participants. Participants were 86 first-year Psychology students (63 female) from an urban university in South Eastern Australia, mean age 23.3 years ($SD = 8.2$). Again, all participants were native speakers of English. As in Study 3.1, these students were part of a larger study (completed in 2010) for which they were given course credit for participation and provided informed consent, and which had ethical approval from the university. Comparisons between the use of texting in the two countries have already been reported in Grace et al. (2012), but no comparisons have previously been made with literacy scores.

Materials and procedure. The Australian students completed the same text messaging task, questionnaire, and two literacy tasks as the Canadian students in Study 3.1, individually in a quiet university room. Participants took approximately 75 minutes to complete all tasks. Categorisation of textisms was completed in the same way as for Study 3.1. Students also completed several further tasks:

1. **Word Attack.** The Word Attack subtest of the Woodcock Reading Mastery Test (Woodcock, 1999) is a standardised test in which students read aloud 45 written

words of increasing difficulty, which constitute a mix of nonsense words and very uncommon words.

2. **Word ID.** The Word Identification subtest of the Woodcock Reading Mastery Test (Woodcock, 1999) is a standardised test in which students read aloud 106 written words of increasing difficulty.
3. **Spoonerisms.** In the Spoonerisms subtest of the York Adult Assessment (Hatcher & Snowling, n.d.), the researcher reads the first and last name of 12 well-known people (e.g., Michael Caine), and the student is instructed to reply with the initial sound of each name exchanged (e.g., Kykle Maine). The test is timed but the Accuracy score is based on the number of correct answers alone (maximum possible score = 24).
4. **Adult Reading History.** Students completed the first section of the Adult Reading History Questionnaire - Revised (ARHQ-R; Parrila, Corkett, Kirby, & Hein, 2003). Respondents rated any difficulties they had encountered with literacy learning in primary school on 15 items with rating options from 0 to 4 on a series of 5-point Likert scales. These items elicit ratings of students' difficulties with reading, spelling and other classwork, with an emphasis on reading. Usually, scores are obtained by adding students' ratings for the 15 items and dividing by the maximum possible score of 60 to produce a proportion. To match the other literacy tasks, we inverted this score so that lower scores indicated poorer literacy.
5. **Block Design.** The Block Design subtest of the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV, Wechsler, 2008) is a nonverbal reasoning standardised test in which students recreate increasingly difficult patterns by manipulating a set of blocks.

Results and Discussion

As in Study 3.1, participants' questionnaire data, literacy scores, and naturalistic text messages were collated, and textisms were categorised. These Australian students' text messages contained an average of .19 textisms per message ($SD = .09$). This was greater than the average textism density in the Canadian messages in Study 3.1 ($M = .16$, $SD = .09$); and an independent-samples t -test showed the difference to be significant, $t(234) = 2.77$, $p = .001$.

The focus of the current study was not to make a detailed comparison of texting differences between Canadian and Australian students, as this question has been addressed in previous work (Grace et al., 2012). However, we note that independent-samples t -tests showed that the Australian students in Study 3.2 had poorer Nonword Reading scores (Timed: $t = -4.35$, Total: $t = -8.96$) and better spelling scores ($t = 3.64$) than the Canadian students in Study 3.1 (all $ps < .001$). The Australian students in this study had owned phones for a mean of 7.1 years ($SD = 2.4$), which an independent-samples t -test showed to be significantly longer than the Canadian students in Study 3.1 ($M = 6.0$ years, $SD = 2.3$, as reported above), $t(234) = 3.53$, $p = .001$. The Australian students sent an average of 23.9 messages per day ($SD = 31.9$), which was significantly fewer than the Canadian students ($M = 39.8$ messages, $SD = 44.5$), $t(233) = -3.53$, $p < .001$ (with a square-root transformation as the data were positively skewed). Finally, Australian students' appropriateness ratings for the use of textisms in messages to a friend averaged 4.5 ($SD = 0.9$), on a Likert scale where 5 was *totally appropriate*. This did not differ significantly from the average Canadian rating of 4.6 ($SD = 0.8$), $t(234) = -.76$, $p = .45$.

Descriptive data for the Australians' task scores are shown in Table 4. Performance on the standardised tasks was within the normal range for these Australian students, as it was for the Canadians.

Table 4

Means for Task Scores (Standard Deviations in parentheses).

	M	(SD)
Timed Nonword Reading ^a	85.4	(6.9)
Total Nonword Reading ^a	104.1	(7.8)
WRAT Spelling ^a	111.9	(11.5)
Word Attack ^a	98.7	(7.5)
Word Identification ^a	99.8	(7.6)
Spoonerisms ^b	22.2	(2.3)
Adult Reading History ^c	0.73	(0.15)
Block Design ^d	10.7	(2.8)

^a Standard scores, ^b Raw Accuracy scores, ^c Inverted proportion scores, ^d Scaled scores

Table 5 shows Pearson correlations between task scores and the texting-related measures: textism density, number of years of phone ownership, message-sending frequency, and opinions on the appropriateness of textism use in texting to a friend.

As shown in Table 5, only weak correlations between literacy task scores and texting-related measures were observed, and again, only a few reached significance. Caution should be exercised in drawing strong conclusions from the relationships that did reach significance, given the number of correlations calculated. That being said, significant negative correlations between textism density and Timed Nonword Reading, Spoonerisms and Adult Reading History indicate that students who used more textisms in their messages had more difficulty with reading nonwords under time pressure and forming spoonerised versions of names, and reported greater difficulties with literacy in their primary school years. It seems clear that any early reading difficulties (as measured on the ARHQ-R) cannot be attributed to textism use, since the earliest age at which any participants reported receiving a mobile phone (ten years) is beyond the age at which children first start to learn to read and write.

Table 5

Correlations (r-values) Between Task Scores, Textism Use, Length of Phone Ownership, Daily Sent Messages and Ratings of the Appropriateness of Textism Use, for Australian Participants

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Timed Nonword Reading											
2. Total Nonword Reading	.73**										
3. WRAT Spelling	.43**	.53**									
4. Word Attack	.40**	.52**	.31**								
5. Word Identification	.51**	.57**	.59**	.56**							
6. Spoonerisms	.32**	.32**	.15	.23*	.24*						
7. Adult Reading History	.40**	.42**	.38**	.22*	.56**	.18					
8. Block Design	.14	.15	.10	.09	.06	-.05	-.01				
9. Textism Use	-.24*	-.13	-.10	.05	-.05	-.22*	-.23*	.13			
10. Length of Ownership	-.05	.03	-.07	.23*	.11	-.20	-.04	.08	.04		
11. Daily Sent Messages	-.12	-.09	.00	-.22*	-.11	.16	.11	.06	-.07	-.01	
12. Appropriateness Ratings	-.24*	-.24*	-.07	-.05	-.10	-.12	-.36**	.02	.25*	-.03	-.07

* $p < .05$, ** $p < .01$

There was a mixed pattern of results for the correlations between literacy scores and the other texting-related measures. For phone ownership, the only correlation to reach significance was a positive one, with Word Attack score, in that students who had owned phones longer were better at reading unfamiliar words. In contrast, daily message-sending rates correlated significantly, but negatively, with Word Attack scores; students who reported sending more messages each day were poorer at reading unfamiliar words. Ratings of the appropriateness of using textisms when texting friends correlated significantly and negatively with both Timed and Total Nonword Reading and Adult Reading History. Students who were poorer at reading nonwords and who reported more difficulty with literacy in primary school, rated textism use as being more appropriate than did other students. Finally, appropriateness ratings correlated significantly and positively with textism use. Just as in Study 3.1, students who rated textism use as more appropriate used more textisms in their naturalistic messages.

To further investigate the possible relationships between these factors and textism use and literacy scores, we conducted multiple regressions with textism use and the two measures with which it correlated significantly; Timed Nonword Reading and Spoonerisms. (Adult Reading History scores were not included as a dependent variable as this task measured participants' early literacy experiences prior to exposure to texting.) In the first instance, we included Block Design as a predictor in each regression to measure the potential contribution of non-verbal reasoning to literacy task scores, however, none of the analyses reached significance for Block Design scores, and so we excluded it from further regressions.

For Timed Nonword Reading, the first model we tested (with sent messages, appropriateness ratings, and ARHQ-R scores as predictors) accounted for a significant amount of nonword reading variance, *Adjusted R² Change* = .20, *F Change* (3,78) = 6.39,

$p = .001$, but the only predictor to reach significance was the Adult Reading History scores, $\beta = .37$, $p = .001$. Naturalistic textism density did not account for any significant further variance. Historical experiences of literacy acquisition are expected to be linked strongly with current literacy skills, and we conducted a further regression analysis without taking into account the influence of ARHQ-R scores. The first model of this analysis included sent messages and appropriateness ratings; these explained a significant amount of variance in Timed Nonword Reading score, *Adjusted R^2 Change* = .08, *F Change* (2,79) = 3.27, $p = .04$. The only predictor to reach significance was appropriateness ratings, $\beta = -.25$, $p = .02$. As above, when textism use was added as a predictor, no further significant variance was accounted for.

Equivalent regressions were conducted for Spoonerism task scores, both with and without ARHQ-R scores as a predictor, but none of the individual predictors was able to explain a significant amount of variance in Spoonerism scores. This suggests that the original correlation between Spoonerism scores and textism use may be accounted for by a combination of factors that each made a non-significant contribution to the relationship.

General Discussion

In previous research with adults, links between literacy skills and textism use have been inconsistent. The present study used a wider range of literacy tasks than most previous studies, and compared literacy scores to undergraduates' use of textisms in their naturalistic messages, rather than in experimental tasks, or as self-reported. Overall, we observed few significant correlations, and those that did reach significance were weak and mainly negative. Further, the patterns of both phone usage and correlations between literacy and task scores differed between Canadian and Australian students.

On average, Australian students had owned a mobile phone for longer (7 years) than Canadian students (6 years), wrote fewer messages per day (24 compared to the

Canadians' 40), and used a greater proportion of textisms in their messages (.19 compared to the Canadians' .16). All of these differences were significant, but mainly small, and it is unlikely that they can fully explain differences between the two samples, as these texting measures were mostly not correlated with literacy measures in the two samples.

In the Canadian group, naturalistic textism use was weakly but significantly negatively correlated with real-word spelling (as also found with US students by Drouin and Driver, 2012), but not with nonword reading. In the Australian group the pattern was the opposite, with no significant correlation between textism use and spelling, but a weak but significant negative correlation between textism use and nonword reading (as found with Australian students by De Jonge and Kemp, 2012). Even when a greater range of literacy skills was tested in the Australian than the Canadian sample, only two further significant associations were observed with naturalistic textism use: a significant negative correlation with participants' abilities to form Spoonerisms (a task drawing on phonological processing ability, which may be implicated in textism use; Plester et al., 2008, 2009), and with their reported history of literacy difficulties at school. It is of particular interest that adults who reported experiencing more difficulty in learning to read as children tended to use more textisms in their messages as adults. Students who found early reading difficult may have experienced lower levels of literacy confidence while forming views about the value of conventional spelling, leading to a greater psychosocial freedom to use textisms as adults. Although this study is cross-sectional, it is clear that these early difficulties with learning to read cannot have been caused by exposure to textisms, which would not have occurred for this sample until well after they had learned to read and write at school.

In line with previous research, we also considered whether literacy skill was related to the length of time that individuals had been text-messaging, and how often they

normally sent text messages. Again, few relationships reached significance, and those that did varied between countries. The number of years of phone ownership correlated significantly and negatively with spelling in the Canadian sample, but significantly and positively with novel word reading in the Australian sample. This is in contrast with the only other published data on this question, which indicated a negative relationship between length of phone ownership and real-word reading in Australian students (De Jonge & Kemp, 2012). In the present study, the frequency of sending messages did not correlate significantly with any literacy measures in the Canadian group, but correlated significantly and negatively with novel word reading in the Australian group. This mixed pattern of results reflects the lack of consistent patterns seen in previous research. Specifically, self-reported message-sending frequency has variously been reported to have a positive relationship with spelling and reading (Drouin, 2011), no significant relationship with spelling (Massengill Shaw et al., 2007), or a negative relationship with spelling, reading, and morphological awareness (De Jonge & Kemp, 2012). Overall, it seems that weaknesses in conventional literacy skills cannot be consistently linked with either longstanding or frequent use of text-messaging.

The Australian students who rated it more appropriate to use textisms found it harder to read novel words than those who rated it less appropriate (a non-significant relationship for Canadians), and tended to have encountered more difficulties in learning to read and spell at school (not measured in Canadians). For the Australian students, at least, opinions about the appropriateness of textism use may be related in some way to previous literacy experiences, as suggested above. This is especially likely given that the skills correlating negatively with textism use were the same tasks that correlated negatively with appropriateness ratings. In both countries, participants' textism appropriateness ratings were significantly positively related to their actual use of textisms, although not to their

frequency of messaging or years of phone ownership. These results suggest that relationships between textism use and literacy scores may also be influenced by social factors.

In children, higher levels of literacy skill have been consistently positively linked with higher levels of textism use (e.g., Plester et al., 2008, 2009; Wood, Jackson, Hart, Plester, & Wilde, 2011). This suggests that these children are more confident and able to experiment with textism use. University students, however, are unlikely to find the formation and use of textisms difficult, and thus any individual differences in textism use may be better explained by their motivation to use textisms than their ability to do so. For example, it is possible that having quite well-developed literacy skills means that most undergraduates feel little pressure to show these skills through their creative use of textisms. In fact, they may feel more pressure to avoid textism use that might be perceived as a sign of immaturity (Lewis & Fabos, 2005) or of substandard language skills (Lewandowski & Harrington, 2006). In contrast, students who struggled with attaining early reading skills might use textisms to cover ongoing spelling difficulties and/or to fit in with a social group with more relaxed literacy standards. Importantly, the meta-linguistic skill of adapting message content to satisfy social expectations applies in both instances, whether by avoiding textisms or converging with group norms for textism use. Future researchers could consider the identity and textism use of the recipients of participants' sent messages to further explore this issue.

Regression analyses suggested that the inconsistency in research findings (in this and previous studies) between textism use and literacy skill may be due to the complexity of influences involved in these relationships. Of the few significant correlations observed, in only one case, WRAT spelling scores for Canadians, did textism use significantly predict literacy scores once message sending rates and attitudes towards textism use were

taken into account. For Australians, once early literacy experiences and attitudes towards textism use were accounted for, timed nonword reading was no longer predicted significantly by textism use. These results suggest that the links between measures of texting behaviour and literacy skill are complex, but that neither texting experience, nor textism use, are important influences on participants' current literacy scores.

The present participants used a proportion of textisms (16-19% of words) not dissimilar to the proportions observed in other naturalistic studies with undergraduates (e.g., De Jonge & Kemp, 2012; Thurlow & Brown, 2003), which, like the current study, included a higher proportion of females than males. Since females have been shown to use more textisms than males (e.g., Rosen et al., 2010; Tossell et al., 2012), textism use may have been rather higher than in a more gender-balanced sample. In terms of timing, it should be noted that our participants had owned mobile phones for an average of six to seven years, and thus on average, their early literacy skills were well established before exposure to text-messaging. It may be that in the future, children who began texting at a much earlier age could experience the influence of text messaging language in different ways (e.g., textisms could become the dominant lexical reference in place of current conventions for spelling). Conversely, the introduction of new technology (including smartphones with full keypads and improved predictive software) may decrease texters' motivation to use abbreviated words. Future research could investigate whether such a trend is observable in students' messages gathered over time.

Crucially, our results suggest that rather than textism use endangering literacy scores, textism use relies on a range of literacy skills that colour the relationship between textism use and literacy, just as early literacy experiences are related to current literacy skill. These skills include the ability to decipher textisms, to add common textisms to the mental lexicon for reuse, and to apply textism-specific conventions to create new textisms,

including those that represent expression and tone of voice (e.g., *blaaargh* to express boredom). However, the results reported here did not include any significant positive correlations between textism use and literacy skills. This may be because such relationships depend on a number of other factors, including competing social pressures, as noted above: alongside concerns for being understood, adults' textism use may be influenced by social pressure to show converging textism use with their conversational partner, and/or to avoid textisms to avoid looking immature. Other factors, beyond those considered here, might also play a role, including the sophistication of the phone technology used, which has been shown to have links with textism use, and to differ between countries (Grace et al., 2012). Figure 1 provides a possible model of the competing pressures on adults' use and avoidance of textisms.

Briefly, our model suggests that the use of textisms depends on a range of factors, including literacy skills. As Drouin and Driver (2012) suggest, some textisms represent the deliberate, creative use of language, while others may instead reflect "lazy" omissions, or abbreviations that disguise ignorance of the correct spelling. We distinguish between both types of textism in this model. The cross-sectional nature of adult texting research to date means we cannot yet draw causal conclusions, but the model includes the possibility that the learning and creation of new textisms may in turn contribute to literacy skills, as has been found in children (Wood, Meacham et al., 2011). Future researchers would do well to follow Rosen et al.'s (2010) lead in considering groups with a more varied range of literacy skills, and also to consider the sophistication of participants' phone technology, as well as their motivations for textism use (or avoidance) in much greater detail.

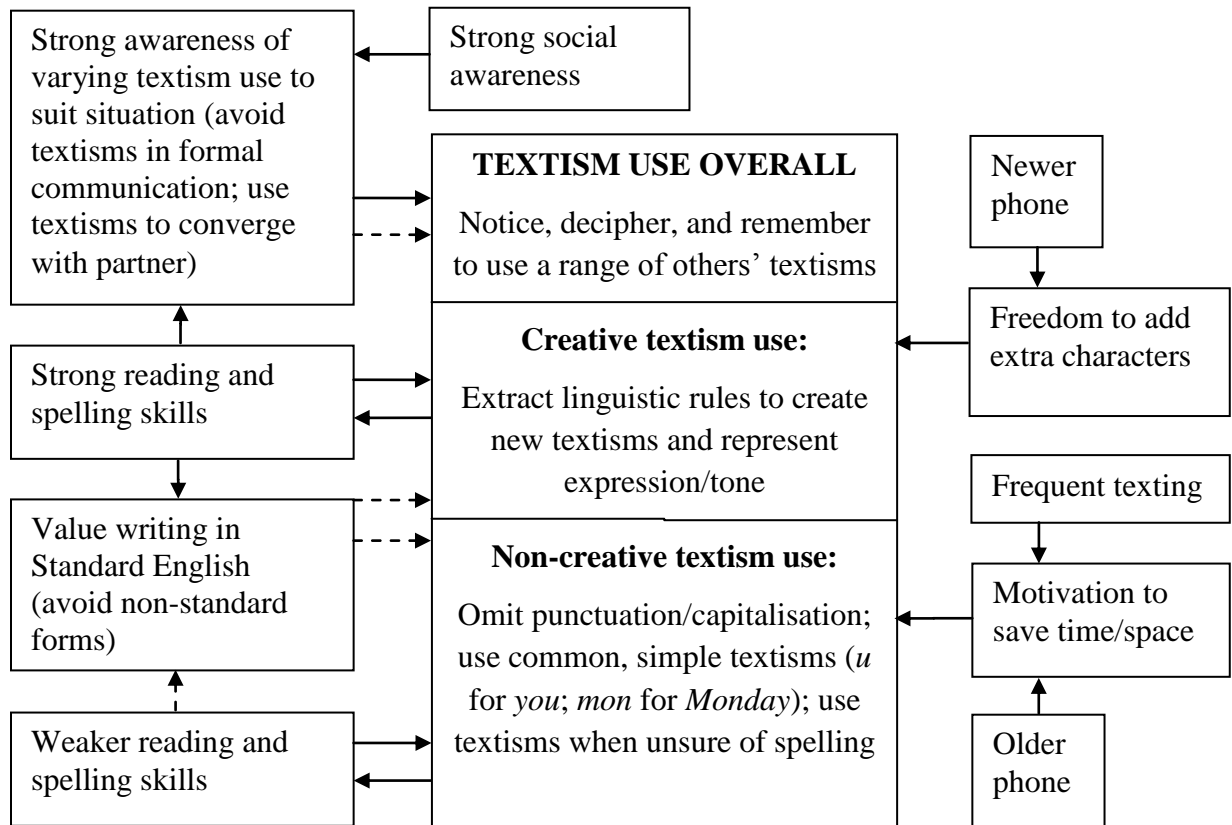


Figure 1

A Model of Possible Links between Literacy, Social, and Technological Factors, and Adults' Use of Textisms

Note: Solid arrows indicate a facilitatory relationship; dashed arrows indicate an inhibitory relationship

The strength of this model, we believe, is to show that textism use is not a linguistic accident in which texters are unwitting participants. The use of textisms instead seems to represent the combination of a variety of linguistic, social, and technological factors that interact when previously established skills in reading and writing are transferred to a new medium. Computer-mediated communication forms such as text messages hold new opportunities for students to play with language, express tone of voice and youth accent, and develop alternative linguistic and social rules by which to communicate in this rapid-fire, written version of informal speech. To relegate textism use in messages to simply an intrusion endangering conventional language is to underestimate

its value as an alternative mode of linguistic expression adapted to the affordances of new communication technology.

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5

Undergraduates' attitudes to text messaging language use and intrusions of textisms into formal writing

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Abstract

Students' increasing use of text messaging language has prompted concern that textisms (e.g., 2 for *to*, *dont* for *don't*, ☺) will intrude into their formal written work. Eighty-six Australian and 150 Canadian undergraduates were asked to rate the appropriateness of textism use in a variety of situations. Students distinguished between the appropriateness of using textisms with different audiences and writing contexts, rating textism use as inappropriate in formal exams and assignments, but appropriate in text messages, online chat and emails with friends and siblings. In a second study, we checked the examination papers of a separate sample of 153 Australian undergraduates for the presence of textisms, by only a negligible number were found. We conclude that overall, university students are capable of recognising audience when considering textism use, and that students are able to avoid textism use in exams despite media reports to the contrary.

Keywords: *Text messaging, SMS, language, textisms, formal writing, exams, undergraduates*

Undergraduates' attitudes to text messaging language use and intrusions of textisms into formal writing

Mobile phone use, already popular, continues to increase exponentially, with 9.6 trillion text messages sent in 2012 (GSMA, 2013) and an estimated 6.8 billion mobile subscriptions worldwide in 2013 (International Telecommunications Union, 2013). The spellings and character usage specific to text messaging and other forms of online communication (e.g., email and instant messaging) have been referred to as “textisms” (e.g., Rosen, Chang, Erwin, Carrier, & Cheever, 2010; Wood, Jackson, Hart, Plester, & Wilde, 2011), and can take a variety of forms. Some textisms represent pronunciation through alternative spellings (e.g., *wanna* for *want to*, *nite* for *night*), others omit characters (e.g., *mon* for *Monday*, *dont* for *don't*), and others add characters (e.g., ☺, ??!). While the use of these word forms may be particularly obvious in text messaging, many have been used historically and predate text messaging, even by a hundred years or more (e.g., *wiv* for *with*, *2* for *to*; Crystal, 2008).

Links between literacy and textism use in messages have been consistently positive in children, with children who used more textisms scoring higher on spelling tasks (Plester & Wood, 2009; Wood et al., 2011) and reading tasks (Coe & Oakhill, 2011). However, results have been mixed for adults. Associations between adults' literacy task scores and texting or textism use have variously been found to be positive (e.g., Kemp, 2010), negative or neutral (e.g., De Jonge & Kemp, 2012; Grace, Kemp, Martin, & Parrila, submitted), and mixed (e.g., Rosen et al., 2010). Overall, these studies reported associations between higher densities of textisms in adults' messages and both higher and lower literacy task scores, both within and between studies. Despite a lack of conclusive evidence, media concerns have persisted that increased use of text language may be

negatively influencing adolescent and adult texters' general literacy skills (e.g., Henry, 2008; Humphrys, 2007). Concerns that textism use will negatively affect formal literacy have been two-fold. Firstly it has been suggested that students will not recognise the situations in which textism use is appropriate and hence textisms may start to intrude into formal writing (e.g., Broadhurst, 2008; Henry, 2008; Llewthor, 2010). Very little research exists to address this concern. However, in a survey of American undergraduates, Drouin and Davis (2009) found that 75% of students believed it to be appropriate to use textisms in informal messages to friends, but only 6% believed it to be appropriate in formal written correspondence with an instructor. These students were also asked to compose emails, in which they were found to use significantly more textisms when writing to friends than to professors. Lewandowski and Harrington (2006) further showed that students perceived that writers were lacking in skill and effort if they wrote formal emails that included (rather than avoided) textisms.

There is some evidence that adults distinguish the appropriateness of textism use not only in terms of formality, but also in terms of the type of digital message being composed. Specifically, adults have been shown to use significantly higher proportions of textisms in text messages than in emails (Clayton, 2012; Frehner, 2008). Although this difference may in part be due to the greater restrictions on space and keyboard imposed by a mobile phone than a computer, this cannot be the whole explanation; even students who use a mobile phone to compose both message types use more textisms in text messages than emails (Clayton, 2012).

The ability to adjust language to specific situations has been extensively discussed in other contexts, in terms of switching between languages within conversations (e.g., Gardner-Chloros, 2009; Sebba, Mahootian, & Jonsson, 2011) and adjusting the style of spoken language to formal and informal contexts (e.g., Biber & Finegan, 1994; Joos,

1961). These skills are also apparent in computer-mediated communication. For example, Jacobs (2008) observed that adolescent females switched between textism use in instant messages and textism-free formal English in school assignment work. While it is likely that students are able to adjust their written language to include textisms in text messages and avoid them in formal writing, very little research has examined individuals' views on the appropriateness of intentional textism use, either within or beyond computer mediated communication. In general, it has been assumed that textism use is largely accepted in the casual register of text messages, but that textisms should not appear in formal written work. This means that students need to adapt their written language as they move between contexts. In the current research, we consider the willingness and ability of undergraduates to avoid textism use in formal writing, exploring the presence or absence of textisms rather than the why and how of textism use in other contexts such as informal text messages.

The second dimension to media concerns is that with sufficient exposure to text messaging, traditional orthographic representations of words in students' mental lexicons will be overwritten by their text-like versions (e.g., Freiss, 2003; Humphrys, 2007; Woronoff, 2007). If this is indeed the case, we might expect to see textisms intruding into students' formal writing, especially in the pressured situation of formal exams. Indeed, there is much anecdotal evidence for the intrusion of textisms into students' writing (e.g., Broadhurst, 2008; Henry, 2008), but empirical evidence is sparse. Of the research that does exist, some has relied on educators reporting on formal writing that they have marked. For example, 25 lecturers and professors of English at a US university reported seeing textism-like intrusions into formal written work (National Council of Teachers of English, 2003). Similarly, of 22 Grade 8-9 English teachers surveyed in South Africa, the majority agreed with the premise that using text language had a negative effect, in that it led students to have lower grades and a reduced knowledge of Standard English (Geertsema, Hyman, &

van Deventer, 2011). However, when asked about specific textism types encountered in assignments (e.g., emoticons, such as :-/ to represent scepticism, and shortenings, such as *aft* for *after*), most of these teachers reported that they 'seldom' observed any of the listed textism types, although they did report 'regularly' observing non-conventional spellings (e.g., *nite* for *night*). Other studies have asked students to self-report their use of textisms in formal writing. A Pew survey reported that 64% of US teenagers say they have used informal writing styles in their school work, with 38% saying they have used textisms such as LOL (for *laugh out loud*), and 25% saying they have included emoticons (e.g., ☺) (Lenhart, Arafeh, Smith, & Macgill, 2008). Mildren (2010) surveyed US middle and high school students, as well as parents and teachers, and found that students who reported using more textisms in their school work had better conventional writing skills, but students who text messaged more often reported finding it more difficult to adjust their writing style between home and school contexts. Interestingly, Mildren also found some evidence to suggest that teachers' text messaging behaviour may influence their perceptions of the effects of texting on adolescents, in that teachers who sent more text messages reported there were fewer textisms in their students' schoolwork than teachers who sent text messages less frequently.

Data from experimental tasks have also shown textism intrusions, but to a more limited extent than suggested by self-report studies. Adults from a range of educational levels who were asked to write a formal complaint letter to a company (average length about 300 characters) produced an average of only about 2.5 textisms per writing sample (Rosen et al., 2010). Similarly, only 18% of American college students who were asked to write formal emails used any textisms, and the highest use of textisms was only four textisms in an email, but 51% of students used at least one textism in the email they wrote to a friend, with up to 14 textisms produced per informal email (Drouin & Davis, 2009).

US high school students were found not to use textisms at all in formal writing samples (Palasz, 2012), despite most of these students reporting that they used textisms in text messages. One previous study has looked at textism intrusions in a naturalistic context: Shafie, Azida, and Osman (2010) studied the exam papers of Malaysian undergraduates in English units. The authors state only that, "Few SMS abbreviations such as 'wut', 'u' and 'ar' appeared on the examination scripts." (p. 30), and note anecdotally that textisms seemed to appear in the papers of students with a relatively high number of spelling errors. Taken together, these experimental findings suggest that, despite popular concerns and anecdotal data, students' inclusion of textisms in formal work is minimal at most. However, to date, no study appears to have provided a specific count or analysis of the textisms that may be present in students' naturalistic formal writing.

We conducted two studies, one to examine university students' views on the use of textisms in various situations, and one on their actual use of textisms in a formal academic setting. Specifically, in our first study, we measured students' opinions of textism use by inviting students to rate the perceived appropriateness of textism use in a variety of formal and informal situations. In our second study, we measured the intrusion of informal text messaging-like spellings into students' written exams.

Study 4.1

In this study we measured undergraduate students' views on the appropriateness of textism use in a range of contexts. We varied the formality in terms of the closeness of the audience (in both social distance, such as between a friend and a stranger, and age, such as between sibling and an older family member) and the type of communication involved (including text messages, emails, lecture notes, and exams). The questionnaire we used invited ratings on a Likert scale, rather than asking students to provide a response as to whether textism use was appropriate or not, as was done in Davis and Drouin's survey

(2009). If, as suggested by previous research, students are aware of different registers of language, and think that textisms are appropriate in some contexts but not others, students should rate textism use as more appropriate in less formal situations (e.g., in a text message to a friend), and less appropriate in more formal situations (e.g., in an email to a lecturer). In contrast, if, as suggested in the popular media, students have forgotten or never learned the need to differentiate registers of language for different situations, students should rate textism use as equally appropriate across more formal and informal recipients and writing types.

Method

Participants

Participants were first-year Psychology and Educational Psychology undergraduates from two similar urban universities, one in South Eastern Australia, and one in Western Canada. There were 86 Australian students (73% female), mean age 23.3 years ($SD = 8.2$) and 150 Canadian students (77% female), mean age 22.5 years ($SD = 4.2$). All students were regular users of text messaging and native speakers of English. The study had ethical approval from both universities, and students provided informed consent and were given course credit for participation.

Materials and Procedure

Participants completed a questionnaire (see Appendix) as part of a larger study, which included questions regarding demographic information and the completion of text messaging tasks. As part of this questionnaire, participants were asked to rate how appropriate they thought it was to use textisms in text messages, email, online chat, and university work, to audiences ranging from a friend to a stranger. (Some combinations of modality and audience such as a text message to a lecturer, or university work written for a friend were omitted, as they would be unusual or meaningless). As shown in the Appendix,

responses were recorded on a 5-point Likert Scale (1 = *not at all appropriate* and 5 = *entirely appropriate*). Students completed questionnaires individually or in pairs in a quiet university room.

Results and Discussion

Participants' mean ratings for how appropriate they thought it was to use textisms in various situations were almost identical for the two countries (confirmed by independent-samples *t*-tests). Therefore, appropriateness ratings were combined for Australia and Canada, and are reported in Figure 1.

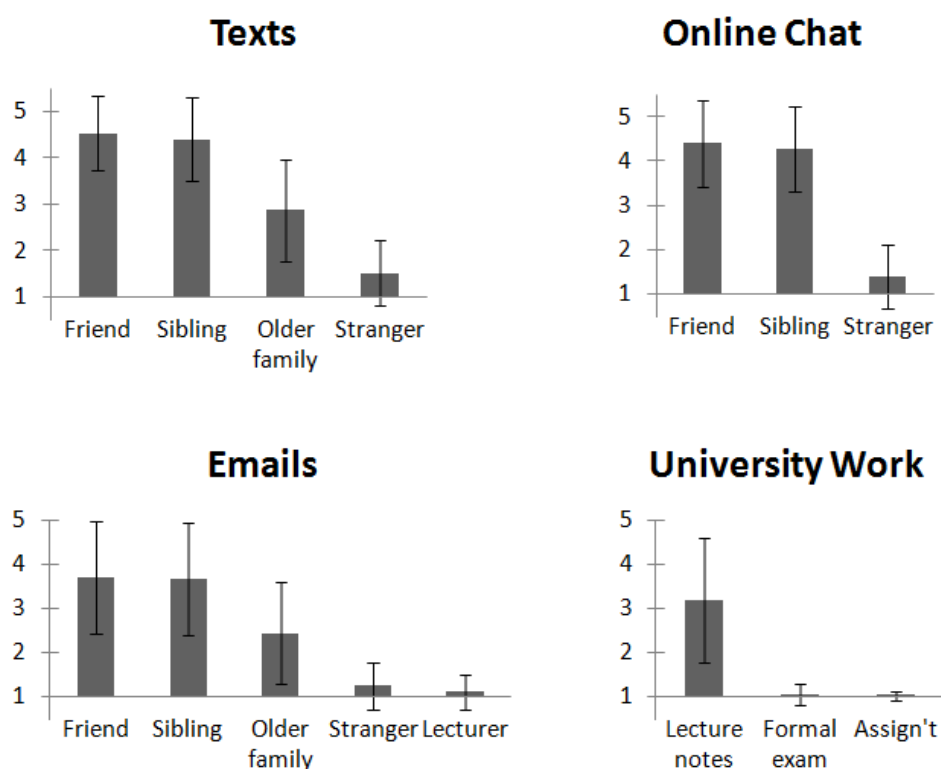


Figure 1

Mean Ratings (and Standard Deviations) of the Appropriateness of Using Textisms across Message and Recipient Types (Likert Scale ratings from 1 = *Not at all appropriate*, to 5 = *Entirely appropriate*).

As can be seen in Figure 1, for the two countries combined, ratings differed with audience for each message type, with a clear decrease in appropriateness ratings from less formal social situations and modalities (writing to a friend, taking lecture notes) to more formal social situations and modalities (writing to a stranger, completing formal university assessments). In contrast to what might be expected from anecdotal reports noted earlier, all but 11 of the 236 students rated textism use in both exams and typed assignments as “not at all appropriate”.

A series of paired-sample *t*-tests were calculated to check for significant differences between audiences and message types/writing forms. Students clearly differentiated between audiences when rating the appropriateness of textism use. For every comparison for which data were available, textism use was rated as more appropriate in all message types to friends than siblings, to siblings than older family members, and to older family than to strangers (all $ps < .001$). The only exception was that the use of textisms in emails was rated the same ($M = 3.7$) when sent to friends or siblings. While differences across message types were not a focus of this study, we note that regardless of audience, appropriateness ratings for textism use were also significantly greater for text messages than for internet chat and chat than emails, across all comparisons (all $ps < .001$). More importantly, textism use was also rated significantly more appropriate in lecture notes than in either type of formal university assessment, namely assignments and exams ($ps < .001$).

The finding that participants varied in their ratings between contexts suggests that not only is textism use considered inappropriate in some cases, but that it is quite acceptable, and perhaps even expected, in others. In some social groups, textism use may be a mandatory component of convergent informal communication, such that to write only in Standard English would transgress the social expectations of many adolescents and young adults. Haas, Carr, and Takayoshi (2011) discuss the ‘intertextuality’ of technology-

based communication, emphasising that social influences dictate the style and content of messages as the writers co-create the conversation. Similarly, Garrison, Remley, Thomas, and Wierszewski (2011) have suggested that norms in computer mediated communication must be assessed within their own social landscape rather than in comparison to Standard English. These views were reflected in the informal comments of some participants in the current study, who noted that they felt there was an expectation to reciprocate with textisms in response to the textism-rich messages that they received.

In sum, participants' ratings of the appropriateness of textism use varied greatly across audience and message types. Textism use across message types was rated as appropriate in messages to friends and family members, but less appropriate in messages to strangers and lecturers. Similarly, students rated textism use as acceptable while taking lecture notes, but they almost uniformly believed textism use in formal assignments and exams to be entirely inappropriate. It appears that by university age, at least, students have a conventional grasp of how the appropriateness of textism use varies across contexts.

Study 4.2

In the previous study we measured students' opinions regarding when they thought textism use was appropriate, but in the present study, we measured the actual behaviour of a different group of students, in the formal situation of the university examination. Specifically, we assessed undergraduates' formal written exams for intrusions of textisms. This forms the first published study, to our knowledge, to estimate the extent of the intrusion of textisms by calculating the number of textisms observed as a proportion of total words written, rather than relying on self-reports or experimental situations. On the basis of the very limited experimental and naturalistic evidence available in previous research (e.g., Drouin & Davis, 2009; Palasz, 2012), we expected to find few textism intrusions in these undergraduate exam papers.

Method

Participants

Participants were a different group of 153 undergraduate students (79% female) from the same urban South-Eastern Australian University as in Study 4.1, in the first, second, or third year of their degree. This study had ethical approval from the university, and students provided informed consent for their exams to be examined for textisms.

Materials and Procedure

A set of 303 papers for final exams which had been completed in previous semesters (late 2009 and early 2010) were examined. Exams came from four disciplines (Psychology, Management, Aboriginal Studies, and Zoology), and contained a total of approximately 533,500 words. These exam papers were checked for intrusions of textisms. Previous analysis of textisms in text messages has often involved categorising each textism according to the transformation from a conventional word or phrase, such as the 'contraction' of *message* to *msg*, or the addition of 'extra letters' to transform *please* to *pleeease* and 'emojicons' such as 😊 (e.g., Ling & Baron, 2007; Rosen et al., 2010). In the current study, textisms were coded according to a scheme used by Thurlow and Brown (2003) and used in modified form by a number of researchers since (e.g., Drouin & Driver, 2012; Grace, Kemp, Martin, & Parrila, 2012; Plester & Wood, 2009) as shown in Table 1.

There are three features of written language that have been counted as textisms in previous text-messaging studies that we did not count as textisms here. First, we did not count the abbreviation of *and* to + or & as a textism. These symbols were used extensively in exam papers, but are rare in text messages analysed for other studies (e.g., Neville, 2003; Plester & Wood, 2009). They are much more likely to reflect time-saving in handwriting than a transfer of a text messaging abbreviation. Second, we did not count misspellings in exams as textisms (e.g., *seperate* for *separate*), although some text-

messaging studies have included a category of misspellings (e.g., Thurlow & Brown, 2003; Drouin & Driver, 2012). Third, we did not count the widespread errors with possessive apostrophes (e.g., *the researchers theory* for *the researcher's theory*) as textisms, as these are so commonly omitted in standard writing by undergraduates (Hokanson & Kemp, 2013). However, we did follow previous research on the use of textisms (e.g., Grace et al., 2012; Plester & Wood, 2009) in counting the much rarer omitted contractive apostrophes (e.g., *dont* for *don't*), but we acknowledge that these do not necessarily represent the intrusion of textisms into formal writing.

Results and Discussion

Table 1 also shows descriptive statistics for textism types observed in these exams, with examples of textism use for each category.

Table 1

Frequency of Textism Types Found in Students' Formal Written Exams

Textism type	Example	No. of occurrences (in 533,500 words)
Contractions	<i>ppl</i> for <i>people</i>	39
Shortenings	<i>recog</i> for <i>recognised</i>	13
Omitted Apostrophes	<i>havent</i> for <i>haven't</i>	26
Single Homophones	<i>4</i> for <i>for</i>	9
Other Symbols	@ for <i>at</i>	13
Expressive Symbols	☺, :(11
Extra Punctuation/Letters	!!!!, ...ahhh...	3
Omitted Capitals	<i>i</i> for <i>I</i>	3
Overall		117

Only a very small percentage of words written in these exam papers could be counted as textisms, and 43 of these occurred in a single student's paper. Of the few expressive symbols observed, all were emoticons, and six of these were included in

sidenotes to the marker (e.g., *continued 3 pages on ... Sorry :o*). Overall, the proportion of textisms of all words in the written exams was a tiny 0.02%. The negligible proportion of textism intrusions found in students' formal exams was even smaller than seen in previous research where students wrote essays and emails under experimental conditions (e.g., Drouin & Davis, 2009; Rosen et al., 2010), and suggests that students remain capable of discerning conventional spellings from textisms and of knowing when to avoid using them.

While students used very few textisms in their exams, we noticed that they used a greater number in their emails giving consent to have their exams included in the study. In the 126 emails that we gained student permission to analyse, we found 41 textisms (4.8%), in a total of 855 words. This post-hoc analysis at least confirms that these students do use textisms in other settings; here, even in an email response to an unknown researcher. The difference between the proportions of textisms used in exams and emails may reflect the fact that words commonly written as textisms in informal or conversational text messages (e.g., *i* for *I*) are less likely to be used in formal exams. Regardless, it is clear that even students who used textisms in their emails were quite able to avoid using textisms in their formal written exams. This conclusion supports previous research in which surveys and experimental tasks have shown that few textisms are found in formal writing (e.g., Palasz, 2012; Rosen et al., 2010).

General Discussion

Concerns that textism use will negatively affect students' literacy skills have been expressed in a large number of media reports (see Thurlow, 2006), but investigations of potential effects of texting on students' formal work have been largely restricted to questionnaires (e.g., Lenhart, Arafeh, Smith, & Macgill, 2008; Mildren, 2010) and laboratory-based experimental studies (e.g., Drouin & Davis, 2009; Rosen et al., 2010).

However, except for a brief report by Shafie et al. (2010) of 'few' textisms appearing in the exams of Malaysian students of English, to our knowledge no measurement of real-world intrusions of textisms into formal written work has yet been undertaken. In Study 4.1, we too examined undergraduates' views of textism use in a variety of contexts via a questionnaire, in which we found that participants rated textism use as less appropriate across increasingly formal situations. This finding is similar to that of Drouin and Davis (2009) who reported students' opinions that textism use was more appropriate in text messages than formal emails. Students in the current study suggested that textism use was more appropriate when sending a message to a friend or sibling, than to an older family member, than to a stranger, with differences between appropriateness ratings reaching statistical significance in almost every comparison. Students also rated textism use as appropriate when taking lecture notes, but not at all appropriate when writing formal assignments and written exams. These ratings varied between modalities, with textism use rated significantly more appropriate in text messages than instant messages (online chat) than emails. This pattern of ratings is perhaps unsurprising in light of previous researchers observing higher proportions of textisms in text messages than emails (Clayton, 2012; Frehner, 2008), which may be due to differences in text-entry technology between computers and phones, as well as the differences in message content in texts versus emails.

One possible limitation of this study is that no measurement of socially desirable response bias was included to check whether students were responding according only to their own preferences or whether they were responding to what they perceived to be the social expectation of the wider group. Future investigators would do well to include such a measure. An interesting extension might be to include further questions that differentiate and compare students' own personal opinions concerning the appropriateness of textism

use in each context with their assumptions about the views of others in their own social groups and beyond.

In Study 4.2, we assessed undergraduates' formal written exams for textism intrusions. Whereas it was found in Study 4.1 that students were able to recognise where textism use is, and is not, appropriate, we wanted to confirm this in a real-world setting. If concerns for students' spelling abilities being threatened by the use of unconventional word forms in text messages are justified, this might be evident in the written work that they produce, especially under the pressure of a written exam. As predicted, however, although the students' exam papers were by no means free of conventional spelling errors (such as *definate* and *verticle*), we found only a negligible number of unconventional spellings that might be considered as textisms. This is despite the fact that these students did use textisms in their consent emails. Furthermore, fewer textisms were found in their consent emails than the proportions of textisms generally reported in studies of undergraduate students' naturalistic text messages (e.g., 28% textisms in Drouin & Driver, 2012; 19% in Thurlow & Brown, 2003). These results fit well with the ratings of students in the first study who, on the whole, deemed textism use in exams to be inappropriate, and also deemed textism use in formal emails as less appropriate than in informal text messages. While educating students as to when and where textism use is appropriate has been recommended before (e.g., Crystal, 2008; O'Connor, 2005; Sweeney, 2010), in this case at least, it seems that these undergraduates were quite capable of differentiating between settings without explicit instruction, as discussed further below.

The present results are important in light of anecdotal concerns expressed previously (by news writers and educators alike) that textisms are appearing in formal school work (e.g., Henry, 2008; National Council of Teachers of English, 2003). The lack of textisms in university-level exam transcripts may provide evidence of educators' efforts

to inform younger students regarding formal writing standards and students' own development of the ability and willingness to avoid textisms in formal writing as they mature.

Taken together, the results of our two studies suggest that thus far, textism use has not undermined students' ability to write words conventionally when appropriate. It is possible that adults in similar age groups who have had limited exposure to further education may be more susceptible to any influence of textism use on literacy skills. Therefore, studies that encompass non-university populations might be a valuable extension to this investigation (e.g., Rosen et al., 2010). There is also potential for researchers to further examine the differences in textism use between different types of digital and written communication, and whether there is a relationship between how individual students vary textism use in messages to different audiences and their conventional literacy skills.

Whether textism use is appropriate in any context beyond informal communication (e.g., smiley faces in emails to university lecturers) is a debate that may yet be renewed as computer-mediated communication continues to increase in popularity. The meta-linguistic skills required to differentiate communication styles across contexts may even be providing opportunities for growth in students' broader understanding of literacy concepts. Opportunities exist for teachers to intentionally address issues of formal and informal writing in the classroom (Roschke, 2008; Turner, 2009), as well as other literacy concepts, such as the larger issue of language change over time. To this end, new forms of written language used in text messaging itself may also be worthy of exploration in classroom studies of computer-mediated communication. Expressive components such as emoticons (e.g., smiley faces), place fillers (e.g., um ...), extra punctuation (e.g., ??!!!) and invented words and spellings (e.g., *blaaargh*, *hellllooooo*) add novel communicative potential to

written texts by giving non-verbal cues and even capturing tone of voice (Herring, 2001; Shortis, 2007). Future studies could consider the inclusion of focus groups to allow for more detailed exploration of motivations for textism use, and the function of the variety of textism types that students use.

As children begin texting at earlier ages, potentially prior to the cementing of early reading and writing skills, the importance of addressing formal and informal language in the classroom may increase. However, overall it is clear that undergraduate students are able to discern levels of appropriateness for textism use in a range of contexts, and with only a negligible number of textisms appearing in exams, appear both willing and able to avoid textism use in formal writing.

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Appendix

Appropriateness ratings

How appropriate do you think it is to use text-message-style abbreviations in each of the following type of message? (e.g., “u” for you, “lol” for laughing out loud, smiley faces)

1 = Not at all appropriate 2 = Not really appropriate 3 = It's okay

4 = Reasonably appropriate 5 = Entirely appropriate

1. Texting a friend
2. Texting a family member of your own age
3. Texting an older family member
4. Texting someone you don't know (e.g., to respond to a for-sale ad)
5. Emailing a friend
6. Emailing a family member of your own age
7. Emailing an older family member
8. Emailing a lecturer
9. Emailing someone you don't know (e.g., to respond to a for-sale ad)
10. Instant messaging/online chat to a friend
11. Instant messaging/online chat to a family member your own age
12. Instant messaging/online chat to an online company website (e.g., to arrange accommodation)
13. While taking lecture notes
14. In a handwritten exam
15. In a typed assignment

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6

General Discussion

General Discussion

Text messaging has rapidly grown in popularity since its invention and this growth has continued through the span of this doctoral research. The number of studies of text messaging language has increased during the same time-frame, involving the reporting of a range of different factors that might affect textism use, such as individuals' texting experience and the technology in use on their phones. Due to the small number of studies available at the start of this project, methodological practices had not been standardised, as the most appropriate methodologies had not been identified. Further, which factors were even important for consideration had not yet been identified. It is now apparent that a number of factors might affect textism use, many of which were not taken into account in earlier research. These include the collection method used to obtain messages, the age and sex of participants, their country of origin, and their attitudes towards textism use in text messages.

The main aim of this thesis was to bring these early findings together and to add new research to allow a more thorough consideration of the factors associated with individual differences in textism use. Thus, this thesis contributes vital insight into the nature of text messaging language, and the range of research conducted on it. Methodological issues were considered in Study 1 (Chapter 2), and the findings regarding message collection then informed the design of further investigations. The subsequent Study 2 (Chapter 3) was the first to collect messages and examine factors associated with textism use across more than one year, allowing conclusions to be made about change over time as text messaging language continues to develop. Taken together, the studies in this thesis include data from over 600 Australian and Canadian undergraduates and involve approximately 70,000 words from 6,000 text messages collected across four years. The complex relationship between the literacy and language skills of texters and their textism

use was investigated in Study 3 (Chapter 4), providing results from a greater range of literacy tasks than used in previous research. Finally, Study 4 (Chapter 5) contributes to the body of knowledge about undergraduates' attitudes towards textism use and their (negligible) use of textisms in real-world formal writing. The main findings of this thesis are summarised in Table 1, further below, and key results are compared and combined below to provide overall conclusions regarding undergraduates' text language.

Methodology and the Nature of Textisms

Study 1 compared text messaging language data collection methods and introduced issues concerning the categorisation of textisms. The findings raise wider issues about researcher versus participant perceptions of what counts as a textism, and the changing meaning of individual textisms over time, as explained below.

Message Collection Methods. Text messages were collected from Canadian and Australian undergraduates via three methods: the translation of messages from conventional English into textese, the writing of messages according to a provided scenario, and the copying of sent messages from their phones. Each participant provided messages from all three methods and also answered a survey question regarding their textism use (see Appendix A for the full set of tasks; ethics committee approval letters for all studies are reproduced in Appendix B). The key finding of Study 1 was that the density of textisms in messages differed with the collection method used: undergraduates produced significantly more textisms in translated than scenario-based messages, and in scenario-based messages than naturalistic messages. This study provides a unique contribution to text messaging language research by establishing that textism data differ depending on the collection method employed and that experimental methods, which are commonly used (e.g., Drouin & Davis, 2009; Plester, Wood, & Bell, 2008), may lead to over-estimations of textism use.

Table 1

A Summary of Major Findings of this Thesis

Central Aim	Findings	Conclusions
<i>Study 1, Aim 1:</i> To investigate how methodological factors, especially message collection methods, affect (perceived) textism use. (Canadian and Australian data).	Effect of message collection method: Overall textism use was significantly higher in translated than scenario-based messages, and in scenario than naturalistic messages. Contractive textism types followed the same pattern, but (conversely) there were more expressive textisms in naturalistic messages than in translated messages. Patterns were similar for both countries.	Experimental message collection methods may over-represent real-world textism use overall, and may not accurately represent the use of specific textism types. Naturalistic message collection is recommended.
<i>Study 1, Aim 2:</i> To investigate how textism use, when measured using a single research design, varies between two countries. (Canadian and Australian data).	Effect of country: Overall textism use was significantly higher in Australian than Canadian messages. Attitudes towards textisms were very similar between countries. Australians had owned phones longer; Canadians sent more messages per day. Textism use varied with technology, and technology with country; technology/country interactions were not significant.	The marked difference in textism use between countries was not easily explained, although texting experience and phone technology differed between countries.
<i>Study 2, Aim 1:</i> To investigate how textism use, when measured using a single research design, varies across time. (Australian data)	Naturalistic messages were collected from four years of first-year university students (2009 to 2012). Overall textism use decreased over time. Contractive and other textism use decreased but expressive textism use marginally increased.	Change in textism use over time was associated with undergraduates' increased use of updated phone technology.
<i>Study 2, Aim 2:</i> To investigate how textism use varies between males and females and across age within the undergraduate sample. (Australian data)	Females used more textisms overall, and expressive textism types in particular, than males. As participant age increased (even in this adult sample), contractive textism use increased and expressive textism use decreased. Younger participants were more likely to access updated phone technology (e.g., touchscreens, predictive software).	Textism use for males versus females may reflect general differences in communication style. Textism use differs with participant age, which was associated with use of phone technology.

Table 1 continued ...

<p><i>Study 3:</i></p> <p>To investigate how individuals' literacy skills are associated with textism use.</p> <p>(<i>Study 3.1:</i> Canadian data; <i>Study 3.2:</i> Australian data)</p>	<p>Canadian participants completed three literacy tasks. The only significant correlation with textism use was a weak negative correlation with spelling scores.</p> <p>Australian participants completed seven language and literacy tasks. The only significant correlations with textism use were negative correlations with scores for timed nonword reading, spoonerisms, and the reading history questionnaire.</p>	<p>Some significant negative correlations between textism use and literacy scores for both countries.</p> <p>For Australians, at least, may be further associated with attitudes towards textism use.</p>
<p><i>Study 4.1:</i></p> <p>To investigate attitudes towards textism use in a variety of situations.</p> <p>(Australian and Canadian data)</p>	<p>Very little difference between Canadian and Australian participants' ratings of the appropriateness of textism use across contexts. Textism use rated as appropriate in texts, online messages and emails to friends/family, but entirely inappropriate in university assignments/exams.</p>	<p>Participants uniformly identified essential differences in the appropriateness of using textisms in informal versus formal situations.</p>
<p><i>Study 4.2:</i></p> <p>To investigate whether there is there evidence of textism intrusions in university students' formal written exams.</p> <p>(Australian data)</p>	<p>A little over a hundred textisms observed in 303 formal university exams (which contained over 500,000 words). Almost a third of the textisms observed (e.g., 2 for <i>to</i>) found in one student's paper.</p>	<p>The negligible number of textisms identified in formal exam papers indicates students are able to avoid textism use in formal writing. Textism use is not an unconscious act.</p>

Importantly, the types of textisms present in messages were also affected by collection method. It was found that messages created for prescribed scenarios, and to an even greater extent, the messages translated from conventional English into textese, contained higher overall textism densities than the naturalistic data. More specifically, these scenario-based and translated messages contained higher densities of contracted textism forms (such as *r* for *are*, *wen* for *when*) than the naturalistic messages. This is important in light of media concerns regarding the abbreviated nature of textese and its

impact on conventional spelling. News articles regarding textese (e.g., Broadhurst, 2008; Humphrys, 2007) have almost uniformly focused on abbreviated textism forms. It is unlikely that the use of expressive textisms, such as adding additional letters and punctuation (e.g., *Fuuuunnnn!!* for *fun*) or emoticons (e.g., ☺, :-P), would cause as much concern for young people's conventional spelling abilities.

One possible reason for the highest densities of contractive textisms appearing in translated messages (compared to scenario-based and naturalistic messages) is that the messages to be translated intentionally included target words (e.g., *you*, *birthday*, and *by the way*) that are commonly written as textisms (e.g., *u*, *bday*, and *btw* respectively) as has been seen in previous research (e.g., Kemp, 2010; De Jonge & Kemp, 2012). It may also be that informed participation in text messaging research biased participants to use higher numbers of textisms in translated messages than they had used in their previously sent messages. However, textism use was not over-estimated evenly across textism types. In fact, the highest mean proportions of expressive textisms were observed in participants' naturalistic messages, which were not subject to bias from perceived researcher expectations. This finding suggests that when participants think of 'textisms', they focus on the contractive treatment of words so strongly associated with early text messaging (and perhaps their own earlier textism use).

Regardless of the reason for the difference in textism use between collection methods, the results of Study 1 provide a reference point to help interpret results where data need to be collected under experimental, rather than naturalistic, conditions, such as when children are not allowed to have their phones at school (Plester, Wood, & Joshi, 2009) or to compare participants' production of specific textisms (De Jonge & Kemp, 2012; Kemp, 2010). Where these issues are not relevant, it is recommended that naturalistic message collection be used in future research.

Survey Methods. Instead of message collection, some previous research has examine textism use through an alternative method, survey-based self-report (e.g., Drouin, 2011; Massengill Shaw, Carlson, & Waxman, 2007; Rosen, Chang, Erwin, Carrier, & Cheever, 2010). As noted in Chapter 2, Study 1 included a survey question regarding participants' use of "abbreviations and 'text message' style spellings" for which approximately half of students surveyed selected "Nothing at all; I try to write all my words in conventional English". Interestingly, a textism density of 13% was found in the naturalistic messages written by these participants. Considering that the overall textism density for all naturalistic messages in that study was only 17%, an initial conclusion is that using this specific question format was an unreliable method of collecting text messaging language data. However, a closer examination of the messages written by these participants showed that, while there were a few examples of contracted forms (such as *u* for *you*), many of the textisms used by this group were expressive textism additions intermingled with conventional English spelling (e.g., *Haha chicken :p xxxxxxxxxxxxxxxxxx*). Perhaps some participants answered the survey question with *only* abbreviations in mind, rather than including the textisms we counted as expressive, such as emoticons, extra punctuation and hugs/kisses. Rather than simply indicating that participants are unaware of their own language use, the (expressive) textisms present in messages written by self-reported non-users of textisms may indicate a difference between researchers' and participants' perceptions of what counts as a textism. Issues concerning the categorisation of words and items as textisms reveal important points about the nature of text messaging language, as do decisions regarding how individual textisms are categorised, as explored further below.

Categorisation Issues. Few categorisation schemes were available at the time of the initial message collection for the first studies of this thesis, and as shown in the

Introduction, the textism categories used by previous researchers then and since have varied greatly between studies. While the detailed categorisation scheme used in this thesis is outlined in Chapters 2, 3 and 4 (Studies 1, 2, and 3 respectively), the examples given there do not represent the full complexity of decisions regarding the categorisation of individual textisms. In Study 1, it was shown that there has been a difference in methods used in previous research between counting textisms such as *im* for *I'm* as one textism (omitted capitalisation or omitted apostrophe) or two (both). Calculations revealed that counting only the first transformation in each textism word excluded 8% of the total transformations, and so it is recommended that future researchers count all transformations in order to capture the full range and proportions of different textism types used in text messages.

Decisions regarding which words should be counted as textisms can be difficult, as shown in the Introduction, and involve respellings that were present long before mobile phones were invented (e.g., *gonna* for *going to*, and *2* for *to*), but are now strongly associated with texting and online communication. Similarly, decisions regarding how to categorise words identified as textisms can be complex. One important example concerns the textism *LOL*, an initialism that has historically been understood to represent “little old lady” or “lots of love”, but in computer-mediated communication “laugh(ing) out loud”. The changing nature of English language has allowed this ‘initialism’ to become a spoken word in its own right, “lol” or even “lols”, similar to the spoken pronunciation “roffle” for *ROFL* or ‘Rolling on the Floor Laughing’, both of which can be used at the end of a phrase to express irony or sarcasm, as well as actual laughter. The exaggeration of emotion often reflected in the use of *LOL* is similar to that noted by researchers regarding emoticon use. Marcoccia, Atifi, and Gauducheu (2008) videoed participants writing online chat messages, and observed that the emoticons produced did not always match the nonverbal

behaviour of the user. Dresner and Herring (2010) note a similar disconnection between emoticon use and likely facial expressions of writers of instant messages, such as when an emoticon is used to soften a statement of exasperation. Garrison, Remley, Thomas, and Wierszewski (2011) suggest that emoticon use in instant messages is contributory, not compensatory, to conversations ruled by conventions specific to computer-mediated discourse. This demonstrates that the meanings of individual textisms have been extended to contain unique communicative value as computer-mediated language use continues to develop. The initialisms *lol* and *omg* have both been described in the Oxford English Dictionary as appearing to convey meaning beyond the phrase each represents, and further that their use may “perhaps parody the level of unreflective enthusiasm or overstatement that can sometimes appear in online discourse, while at the same time marking oneself as an ‘insider’ au fait with the forms of expression associated with the latest technology.” (OED, 2011, p. 1). Clearly textism use has moved beyond a mere contracting of words to maximise limited character space in messages and has taken on levels of meaning not possible in its infancy.

The categorisation of individual textisms will remain a complex task in light of the many possibilities open to texters when respelling words, the shifting meanings within individual textisms, and the many options available to researchers when categorising them. Awareness of these issues is crucial when making comparisons of textism densities between studies, as it is now clear that variations in textism categorisation and message collection methods between studies can influence results. However, there are several further factors that may affect textism use, as discussed below.

Factors Associated with Variations in Textism Use

As outlined in the Introduction, previous research shows that a number of factors have been associated with textism use, including sex (e.g., Plester et al., 2009), phone

technology (e.g., Kemp & Bushnell, 2011), and literacy task scores (e.g., Drouin & Davis, 2009; Kemp & Bushnell, 2011; Wood, Jackson, Hart, Plester, & Wilde, 2011). The present studies also revealed that textism use might vary with participant age and the country in which messages were collected. However, many previous studies of text messaging language have involved the consideration of only one or two factors, and possible interactions between factors have been largely ignored. The studies reported in this thesis can provide further insight into these interactions.

Country. In Study 1 it was found that textism density varied with the country in which messages were collected. Australian participants used more textisms than Canadian participants both for textisms combined over all three collection methods, and when the naturalistic messages were considered separately. The use of specific textism types also differed between countries, with Australians using more expressive symbols and omitting apostrophes more often than Canadians. Interestingly, Australian students also used higher proportions of homophones and nonstandard spellings than Canadians, and slightly higher proportions of shortenings than Canadians. It is possible that there is a connection between the higher use of these textism types in Australia and the common use of hypocoristics in Australian English, in which the endings of words and names are abbreviated or modified in some way (e.g., *choccie* for *chocolate*; *Maccas* for *McDonalds*; Kidd, Kemp, & Quinn, 2011).

Time. In Study 2, naturalistic messages were collected from a similar cohort in Australia over four years, and it was shown that textism use also differed across time. Total textism proportions were significantly higher in 2009 than in each subsequent year, and in 2010 and 2011 than in 2012. The types of textisms observed in messages also changed over time. There were significantly more contractive and ‘other’ textisms than expressive textisms in texts from 2009, and other textisms than expressive textisms in

2010. In 2011 and 2012 there were no significant differences between textism types, and by 2012 there were more expressive textisms than ‘other’ textism types. If the direction of this change continues, expressive textisms may soon be the most common types seen in future messages.

Texting Experience and Age. The average number of years that Australian and Canadian participants had owned phones and the average number of messages participants sent per day were not significantly related to total textism use, as reported in Study 1. Therefore, texting experience itself is unlikely to explain differences in total textism densities between countries or across time. However, significant associations were revealed when different categories of textisms were considered. When naturalistic messages in Australia were analysed in Study 2 (with data combined over time) it was found that longer phone ownership was significantly related to higher densities of contractive textisms and to lower densities of other textisms. Conversely, also in Study 2, higher daily sending rates were significantly related to lower densities of contractive textisms and higher densities of expressive textisms. Therefore, although longer phone ownership was associated with more contractive use, higher daily sending rates were associated with lower contractive use. This apparently inconsistent pattern of results may be explained by the following associations between participant age and textism density in messages.

Correlations for Australians’ naturalistic messages showed that with increasing age, significantly higher proportions of contractive textisms were used at each time-point in Study 2, and significantly lower proportions of other and expressive textisms were used across nearly every time-point. Unsurprisingly, increasing age was significantly associated with longer phone ownership, and also with lower message sending rates. Therefore, for contractive textism use at least, it appears that age has a stronger influence on textism

types observed in messages than texting experience. As noted in the Introduction, age differences have largely been ignored within studies of adult populations, with study participation age limits for some studies (e.g., 25 years in Rosen et al., 2010) and no age limits for others (e.g., Faulkner & Culwin, 2005). Although most participants were under the age of 20 years in the current research, there was no restriction placed on participant age, and therefore messages may contain higher proportions of contractive textisms than other studies. However, total textism use was not significantly related to age and is unlikely to have been affected by the inclusion of a greater number of “older” (post-25 or so) adults.

Sex differences. As found in previous studies (e.g., Rosen et al., 2010; Tossell et al., 2012) Study 2 confirmed that females used more total textisms than males in their naturalistic messages (in Australia, combined across time). In particular, females used more expressive textisms than males. As noted in the Introduction, ratios of females to males have varied greatly in previous studies of text language, from 12.5% females (Faulkner & Culwin, 2005) to 100% females (Ling & Baron, 2007), and so it is important that the ratio of females to males is reported in future studies. The studies for this thesis included ratios from 73% to 79% females, which may mean that proportions of textisms overall, and expressive textism in particular, are slightly higher than would appear in studies with a closer balance of sexes. However, the results remain comparable with those of many other studies, as most other studies have also included more females than males (e.g., 59% females in Rosen et al., 2010; 72% in Drouin & Driver, 2012; 82% in Kemp, 2010).

Attitudes towards Textism Use. Study 2 (and 3) provided data on whether the differences in textism use seen between countries, time-points, and age might actually stem from differences in participants’ attitudes towards the use of textisms. There was a

significant positive association between these attitudes and textism use, in that the greater the appropriateness ratings that participants (both Australian and Canadian) gave to textism use in text messages to friends, the more textisms they used in their messages in naturalistic messages. However, appropriateness ratings did not differ significantly across country or time, or with participant age or sex.

Phone Technology. As shown above, neither texting experience nor attitudes towards textism use can fully explain the differences in textism use across country, time-point, age or sex. It is more likely that the differing uptake and use of updated phone technology by these undergraduates provides a key explanation for some of the observed effects on textism use. In Study 1, it was shown that users of alpha-numeric keypads produced more textisms than users of full QWERTY keyboards. When expressive, contractive and other textism types were considered separately in Study 2, few effects of hardware were evident. However, it was assumed that the effect of typing on a keypad versus a keyboard is somewhat negated by the use of predictive software, which allows for single-press text-entry even from an alpha-numeric keypad. When effects of software were analysed in Study 1, it was shown that the messages of multi-press entry users contained more textisms than users of either single-press text-entry method (with or without predictive software). Similarly, when textism types were considered separately in Study 2, it was shown that contractive textism proportions were highest in multi-press users' messages, whereas expressive textism types were highest in messages produced using predictive software. Therefore, it seems that the technology on participants' phones influences their textism use overall, and specifically that newer technology is associated with the use of fewer contractive and more expressive textism types.

The differences observed across varying text-entry options in Studies 1 and 2 are similar to results regarding country, time and age reported in the same studies. Regarding

the difference between countries, in 2010, as shown in Study 1, fairly equal numbers of Australian participants used keypads versus keyboards most of the time, but three times as many Canadians used keyboards than keypads most of the time. As alpha-numeric keypads were associated with higher textism densities than were QWERTY keyboards, this technology difference may provide a partial explanation as to why Canadians used fewer textisms than Australians. Similarly, in the same study, multi-press text-entry was associated with higher textism density in messages, and a higher percentage of Australians (14%) used multi-press text-entry than Canadians (9%). In Study 2, the same pattern of differences in phone technology was observed over time. Between 2010 and 2012, keypads became increasingly replaced by keyboards, in line with the decrease in textism use over this time. Finally, keypad users, on average, were older than keyboard users, and multi-press users were older than users of single-press text-entry methods (predictive or not). In summary, older participants had generally owned phones for longer, used older technology, and sent fewer messages per day, than younger participants. Even though older participants' ratings of the appropriateness of textism use were slightly (but not significantly) lower than those of younger texters, older participants used more textisms in their messages. This result highlights the overriding association between phone technology and textism use, although the balance between older participants choosing not to update their phones, and the ownership of newer phones influencing textism use, is not clear. It is therefore recommended that future research take into account the phone technology available to participants, especially where experiments require the use of mobile phones within data collection tasks.

Textism Use and Literacy Skills

The restrictive nature of older phone technology (such as alpha-numeric keypads and 160-character message-limits) led to the highly abbreviated nature of early text

messaging language; the language that prompted concerns presented in the media over the potential effect of texting on English language. These concerns have centred on fears that young people are (or will become) unwilling or unable to avoid textism use. However, as explained in the Introduction and in Study 3 (Chapter 4), investigations into links between literacy and textism use have shown positive results for children (e.g., Coe & Oakhill, 2011) and mixed results for adults (e.g., Drouin, 2011). In Study 3, literacy and language task scores were compared with naturalistic textism use in both Canada (Study 3.1) and Australia (Study 3.2). Only four of ten correlations were significant (and negative), and these were only weak (see Table 1). Of particular note was a significant correlation that showed that students who had found learning to read and associated literacy tasks the most difficult as children, had rated textism use as more appropriate than did other students. The fact that this task concerns literacy experiences prior to mobile phone ownership helps to exclude textism use as a mitigating factor in lower task scores in this instance. Only three significant correlations were found in the 20 correlations calculated between literacy and language task scores and measures of texting experience. For Canadians, lower spelling scores were associated with longer phone ownership in Canada, while for Australians, higher Word Attack scores (one of two nonword reading tasks) were associated with longer phone ownership and lower message sending rates. The very small number of significant correlations out of all the relationships tested indicates that for adults at least, increased texting experience (longer phone ownership and greater numbers of sent messages) was not consistently associated with lower task scores.

Not only has research on text messaging failed to show any association between texting and poor conventional literacy foretold in early news articles (as reviewed in Thurlow, 2006), it may be that textism use is, in itself, a skill that draws on several aspects of linguistic and meta-linguistic ability. It has been proposed that positive results for links

between literacy and texting for children may be related to literacy confidence necessary to use textisms, and the benefits of word play found in textism use (Plester & Wood, 2009). These aspects of textism use may go some way to explain mixed results for adults regarding literacy scores and text messaging. Although highly literate adults may feel social pressure to avoid textism use in an effort to display their superior conventional skills, these same adults may experience higher confidence and ability to use textisms in efficient and inventive ways. Adults who do not have the same literacy confidence are nonetheless able to produce textisms, as shown in previous results, but may experience a greater motivation to avoid the constraints of conventional spelling through textism use. These competing motivations may cloud results for adults, resulting in higher textism use being associated with both better and poorer literacy skills in individuals.

Textism use is reliant on several aspects of literacy skill. The intentional inclusion of textisms in messages involves the linguistic confidence to deviate from traditional writing. The use of textisms to maximise message efficiency (e.g., *u* for *you*, *awsum* for *awesome*) requires sufficient understanding of the phonology and orthography of words for textisms to be understood by others. Other linguistic skills in textism use include the ability to learn common respellings (e.g., *hafta* for *have to*) and even create new alternative words in traditional and novel ways (e.g., *towning*, which refers to *going to town*). Additional demonstrations of skill include creative expression in textisms such as representations of tone of voice (as in *comingggg*), the inclusion of novel words (e.g., *blaaargh*, *Psssh* to express boredom and/or distaste), the use of capital letters to emphasise words (e.g., *foreign contaminant*, *FOREIGN CONTAMINANT*) and of extra letters to extend words or soften phrases (e.g., *yaysies* from *yay*, or *ummmm this is major awkward*). The text message is, and possibly always was, a landscape in which quickfire communication and linguistic artistry combine. Thurlow and Brown (2003, p. 18)

recognised this aspect of text messaging language, stating that “just as new linguistic practices are often adaptive and additive rather than necessarily subtractive [*sic*], young text-messagers manipulate conventional discursive practices with linguistic creativity and communicative competence in their pursuit of intimacy and social intercourse.”

Textism use is further dependent on meta-linguistic skills around recognising audience and adapting language output accordingly. Texters must recognise when textism use is appropriate primarily so that messages are understood and inoffensive, but also to mirror other texters’ language style for the purposes of group identification, especially among youth (Baron, 2005; Green, 2003; Lewis & Fabos, 2005). For example, Tossell et al. (2012) showed that females used approximately twice as many emoticons as males. This may reflect females’ perceived freedom to use expressive language in messages as much as it may indicate a greater emotional experience by females than males in general. Similarly, representations of youth stylisations, such as *fo sho* for *for sure* and *defs* for *definitely*, would be more appropriate in messages between adolescents than older men and women. It may be that the novelty of the use of some textism types is diminishing over time and may become increasingly associated with younger users (Lewis & Fabos, 2005), in which case adults may restrict their use of specific textism forms accordingly.

In Study 4.1, it was reported that responses regarding the appropriateness of using textisms differed across both communication modality (with textism use rated as more appropriate in text messages than instant messages than emails) and social relationships (with textism use in texts, emails and instant messages rated as more appropriate to friends than siblings than older family members than strangers). Textism use was rated as appropriate in lecture notes, but not in formal exams and assignments. Clearly students were able to distinguish between situations with regard to how appropriate it would be to use textisms in each context. More importantly, when the formal written exam papers of

another participant group were checked for the presence of textisms, in Study 4.2, a negligible number were found, despite the same undergraduates using textisms in their email correspondence for the study. This is the ‘proof in the pudding’ that students were not only willing, but also able, to avoid textism use in their formal writing.

A summary of the relationship between textism use and each of the factors considered in this thesis is presented in Figure 1, which builds on the model presented in Chapter 4 regarding textism use and literacy skills. In the model presented, the effects of change over time and differences in textism use between countries are shown to be related to the technology on texters’ mobile phones, and effects of age are also shown to have a relationship with phone technology and subsequent textism use. Overall, students appear to employ technology and/or textisms to further their presumed goals of character efficiency and message writing speed and creative enhancements in the form of expressive textism use. These adaptations display one’s abilities to manipulate language to suit the social and situational needs of the communication at hand. Rather than taking away from conventional English, text messaging appears to be an opportunistic style of communication that enables users to experiment with words and enhance their communication. The contribution of words such as *lol* and phrases such as “sad face!” into spoken English further underlines the unique meanings textisms are developing and their growing place in contexts that extend beyond text messages and other forms of computer-mediated communication. Some texters do write in conventional English, but many use inventive spelling and character additions to capture aspects of speech otherwise unavailable in the silence of a written message.

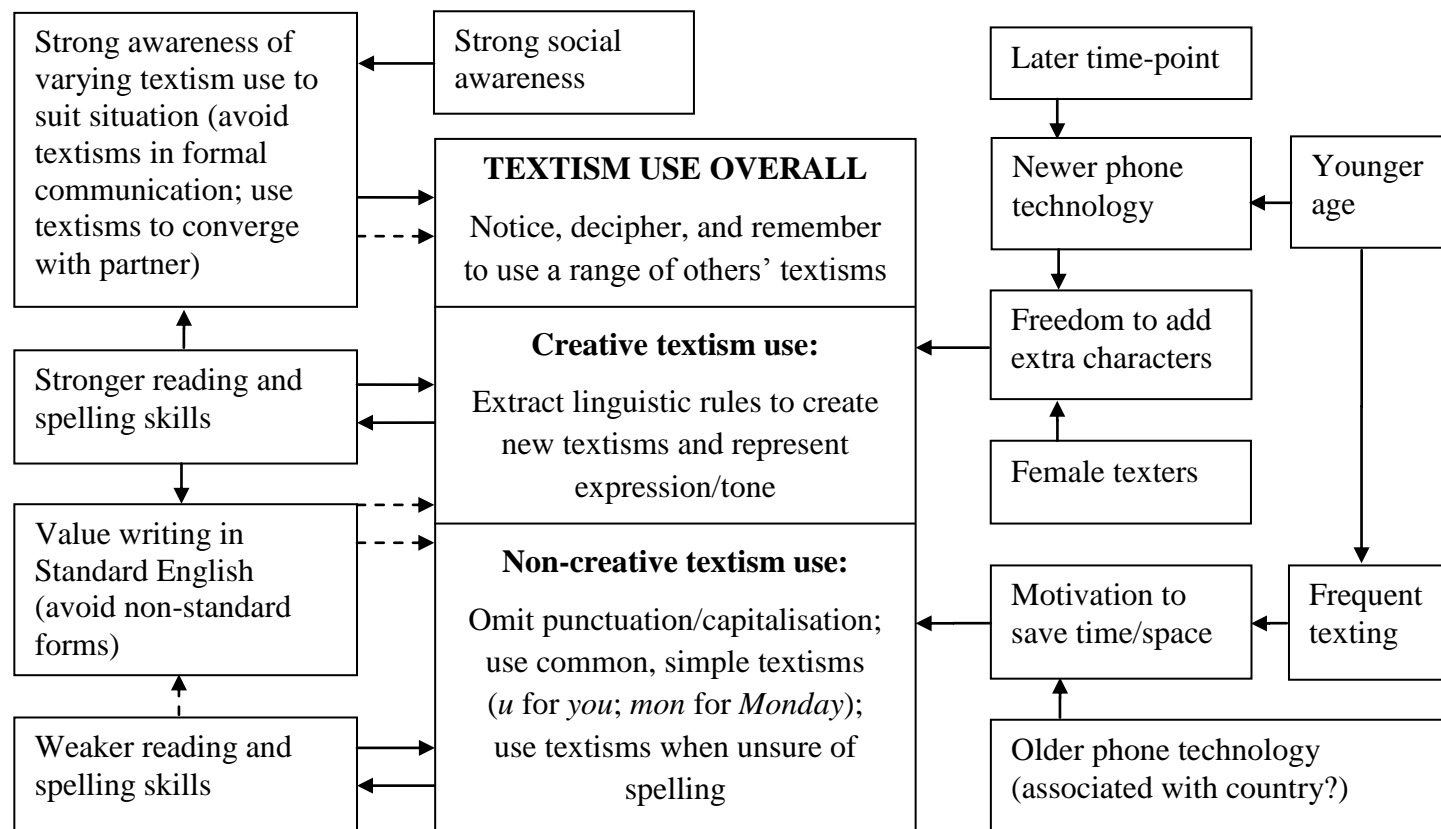


Figure 1

A Model of Possible Links between Adults' Use of Textisms and Literacy, Social, Time-point, Technological, Age, Sex, and Country Factors

Note: Solid arrows indicate a facilitatory relationship; dashed arrows indicate an inhibitory relationship

Several researchers have referred to the playful aspects of language used in all forms of computer-mediated communication (e.g., Baron, 2003; Danet, 2001; Soffer, 2010), and the fact that texting represents a form of written speech that goes beyond being simply a new form of writing (Crystal, 2001; Frehner, 2008; McWhorter, 2013). For this reason, some researchers have suggested that textism use should be evaluated according to the conventions of computer-mediated communication and the social and relational values that drive new language forms rather than against marketplace requirements for Standard English (Garrison et al., 2011; Thurlow & Bell, 2009).

Limitations

An obvious limitation of the studies reported here is that university undergraduates are not necessarily representative of all mobile phone users. In particular, university students are likely to have superior literacy skills when compared to the general population, and may have a higher motivation to show researchers that they use conventional spelling than non-university students, even in their text messages. Participants transcribed sent messages privately and therefore may have chosen or copied messages selectively; it was not possible to check the accuracy of transcription.

Furthermore, the results of Study 3 (Chapter 4) showed that if there is a negative link between literacy skills and textism use, it may be clearer in participants with poorer scores on literacy tasks. This also highlights the need to examine the relationship between textism use and literacy task scores for non-university participants. It further raises questions regarding the experience of students with learning disabilities, specifically their ability to create and interpret textisms and whether textism use enables or impedes communication for this group. Speculation about the motivation of texters with good and poor literacy skills regarding their textism use, and the use of textisms to mediate social communication by converging with other texters' style of language, could be better

informed by research designed specifically to explore the opinions of individual phone users on these matters.

In Study 2 (Chapter 3), information about textism use was collected and analysed in 2009 through 2012, but questions on phone technology were included only from 2010 onwards. The largest drop in textism use (and in contractive textisms in particular) was observed between 2009 and 2010. Because information on phone technology was not collected in 2009, it is not clear whether this decrease in textism use could be attributed to any dramatic change in these participants' use of phone technology. Furthermore, although the studies of this thesis included relatively large numbers of participants, the consideration of several factors at once also excluded the possibility of several analyses due to issues of group size (e.g., dividing participants into males and females, in each year, for each technology type, for older and younger participants). These analyses are less relevant now that updated phone technology (e.g., touchscreens) is used in such high frequencies. However, they may have informed earlier results to have collected data from larger numbers of participants while older phone technology was still commonly in use. One of the strengths of this thesis is that it captures textism use data from a time of rapid development in phone technology and language change that cannot be recreated.

Conclusions and Future Studies

The research presented in this thesis is the first to show that different message collection methods can affect estimates of textism use. The research also raises key questions regarding the nature of textisms themselves. It has been shown that the use of textisms in general can provide opportunities for creative language play and reflect aspects of social identity and group membership. Analysing contractive and expressive textism types proved invaluable for differentiating the effects of several factors, including message collection methods, change over time, phone technology use, and participant age.

While textism use differed with country, time-point, texting experience, and to a lesser extent, participant age and sex, associations between textism use and updated phone technology seemed to be key to understanding these differences. It seems that differing attitudes towards textism use offer some explanation for any relationship between lower literacy scores and higher textism use. However, too few of the literacy tasks showed any association with texting behaviour to provide support for concerns regarding text messaging and literacy for this population. Undergraduates showed good understanding of the situations in which textism use is, and is not, appropriate and successfully avoided textism use in their formal written exams with very rare exceptions.

In summary, students seem to adapt to technology in order to communicate as efficiently as possible, whether by using shortenings to overcome technological restrictions, or, as phone technology improves, by adding a growing proportion of enhancements such as expressive textisms that represent tone of voice. Overall, they display knowledge of when and how to use textisms to maximise social and individualised communication.

The potential for further studies in this area remains high, as it is still a relatively new area of research that involves computer-mediated language which is undergoing continual change. Text messaging language may be used differently by university students and non-students, and it is important to capture the wider language in use in society rather than always being restricted by convenience sampling, as in this thesis. As phone technology and text language continue to change over time, further studies could track development of language and its relationship with phone technology. As phones begin to be owned by children of younger and younger ages, the relationship between textism use and literacy skills needs to be re-examined in the light of potential negative effects of textism use that occur prior to conventional spelling rules being consolidated.

Future Research

Future studies of text messaging language may need to be adapted to the growing overlap between computer-mediated communication forms, such as the use of email, chat and texting from mobile phones, and the sending of text messages via online websites. Hybrids such as the iPhone and iPad allow each of these message types to be used interchangeably, with young people on public transport, for example, switching effortlessly between each in conversations unbounded by the format in which they technically occur. Developments such as these further reflect the adaptation of technology by its users for the purposes of convenience and efficiency in communication, and the continued changes in informal language use. Therefore, studies could be designed to compare the types of textisms used in text messages, online chat conversations, and emails created by participants with each participant providing naturalistic messages for each format. This would build on the model of research used in Chapter 2 of this thesis, where participants each created or provided messages via each collection method (translation, scenario-based, and naturalistic). It is important that naturalistic messages are used, as it has been shown here that messages that had been composed and sent naturalistically included fewer textisms, especially fewer contractive textisms, than messages created under experimental conditions (Chapter 2).

Further questionnaire data should also be sought to allow further investigation into the types of messages participants use, such as whether text messages are being sent via mobile phones or computers (desktop or laptop), in light of the popularity of recent developments such as the iPad and email-capable smartphones. This is a burgeoning issue that may affect future data in similar ways to changes in phone keyboards and software use that were not investigated in the 2009 version of the questionnaire, but showed important effects after inclusion in subsequent years in this thesis (see Chapter 3). Furthermore, to

extend investigation into the associations between textism use and the age and attitudes towards textism use of participants, similar studies could be completed with a single research design across a greater range of participant ages. For example, most studies of adult users of text messaging have been completed with undergraduates (e.g., Drouin & Driver, 2012; Kemp, 2010; Ling & Baron, 2007), but a study of phone use across age groups in Norway showed that text messaging is used by adults of all ages with a peak in early adulthood (Ling, Bertel, & Sundsøy, 2012). It is important to establish whether results from studies of undergraduates are representative of the texting behaviour and language of older adults who text less frequently (and perhaps for different reasons) and other members of the general community (e.g., beyond the academic context). A repeat of the design used in Chapters 2, 3, and 4 could not simply be applied to a different cohort (e.g., older adults) to compare texting across age with results in this thesis, as the results of the studies reported here have also shown that textism use is changing over time. Therefore, this kind of investigation, while able to be completed with the same design as in these chapters, would be best completed across age groups at a single time-point.

The main lesson to be learned about study design through this research is that it is important, given the number of factors that seem to be associated with textism use, to examine possible factors in combination. Researchers are advised to collect data on all relevant factors that may be associated with variations in textism use (e.g., both the technology and the type of device on which messages are being created). The possible influence of factors not directly under consideration should be controlled where possible (e.g., by considering different samples of participants at only one time-point within a single study-design to lessen any effects of change over time). Whereas previous research has established that it is important to consider several different factors when investigating textism use, this thesis provides evidence that investigation of these factors in combination

can provide even richer understanding, as found in relationships between age, attitudes, and phone technology in Chapter 3.

Overall, students enhance their communication to maximise speed/ease (efficiency) and communicative potential (expressiveness) according to the social and technological situation in which they find themselves. The ability of texters to participate in textism-rich conversations and to further develop text messaging language style can be seen as an addition to, not a deletion from, their overall set of literacy skills. As new developments in technology arise in the future, this adaptive tendency, both purposeful and incidental, will no doubt continue as users capture its potential to enhance their communication.

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Appendices

Appendix A

Following is a copy of the information sheet, consent form, questionnaire and text messaging tasks as presented to participants in Australia in 2010. Exercises 1 and 2 were presented in counter-balanced order.



**Information Sheet for University Students
Text Messaging and Language Skills**

Chief investigator: Nenagh Kemp, School of Psychology
Student Investigator: Abbie Grace, School of Psychology

Invitation

You are invited to participate in a research study examining how students use language in text messaging and how this relates to aspects of literacy. This study is being conducted by Dr Nenagh Kemp and PhD student Abbie Grace who is being supervised by Dr Kemp.

What is the purpose of this study?

The purpose is to investigate how young adults use abbreviations and other forms of language when they compose text messages in real life, to dictation, or in response to a given scenario. The study will examine things like types and proportions of abbreviations used and how these aspects of text messaging relate to more traditional literacy skills such as reading and spelling.

Why have I been invited to participate in this study?

All first-year Psychology students have been invited to participate. To participate, you need to have your own mobile phone and you need to have experience in writing text messages.

What does this study involve?

If you choose to participate, you will be asked to attend one 45-minute testing session with a small group of students. You will be asked to fill in a questionnaire collecting non-identifying information about things like your age, when you got your mobile phone and how you use it, and how appropriate you think it is to use text-message-style abbreviations in various message types. You will not use your phone to actually send any messages. You will also be asked to write down, from your mobile phone, the five or so most recent messages you have sent (adding up to at least 50 words), although you should choose only those messages you feel comfortable sharing, which do not contain any clearly identifiable names. You will be given several written messages, and you will be asked to write down how you would write them as text messages, if you were sending them to a friend. Finally, you will be given several scenarios (e.g., you are going to be late to meet a friend) and asked to write down the type of text-message you would send to a friend in that situation. You will then be asked to complete a short non-verbal reasoning task, and a nonword reading test. The experimenter will record how you read aloud these words so that she can check the accuracy of her scoring, before deleting the recordings.

After we have scored these tests, we will invite some participants back to complete a further 30 minutes of literacy tests. If you come back for this second session, you will complete three one-on-one tasks: reading aloud some real words and some non-words, and changing the sounds of some spoken words.

It is important that you understand that your involvement in this study is entirely voluntary. If you are invited back to complete the further tests, you do not have to accept the invitation, but we would be very happy to have you participate. While we would be pleased to have you participate, we respect that you have the right to decline. There will be no consequences to you if you decide not to participate, and this you will not be treated any differently. If you decide to discontinue participation at any time, you may do so without providing an explanation.

All information will be treated in a confidential manner, and data will be kept securely at the School of Psychology in locked cabinets and in password-protected computers. All individual identification through names will be removed from the data collected, and individuals will be identified only through ID numbers. Individual responses will not be identifiable in published results, as all data are being considered as a group. The raw data will be kept for a minimum of 5 years after publication, as per University requirements, after which they will be shredded/deleted.

Are there any possible benefits from participation in this study?

You may find it interesting to consider your own text messaging behaviour in different tasks. You may also find it interesting to participate in a “real-life” psychology experiment, and will receive 45 minutes’ course credit for taking part. As a result of participating in this research, you may be invited back to complete further literacy tests, for which you will receive a further 30 minutes’ course credit on completion.

In a wider sense, these results will provide information for others regarding how text-messaging is used, and how language skills can be taught in a way which maximises the use of new technologies. They will also provide important information on whether different message-collection methods yield comparable data.

Are there any possible risks from participation in this study?

There are no specific risks associated with participation in this study, and participation is not expected to induce undue stress or anxiety. The tasks are relatively easy and interesting and are not substantially different to what you might expect to do in everyday life.

What if I have questions about this research?

If you would like to discuss any aspect of this study please contact either Dr Nenagh Kemp on ph 6226 7534 or Abbie Grace via email at aagrace@utas.edu.au. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information, a summary of the results will also be made available on the School website.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee H10530. However, if you have concerns or complaints about the conduct of this study you should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H10530.

You will receive a copy of this Information sheet, and of the statement of Informed Consent. One copy of the Consent form should be signed for the investigator, and one will be given to you to keep for your own records.

Thank you for taking the time to consider this study.

Dr Nenagh Kemp
Chief Investigator

Ms Abbie Grace
Student Investigator



**Statement of informed consent for Participants
Text Messaging and Language Skills**

Please read the declarations below and print and sign your name in the space provided.

Chief Investigator: Dr Nenagh Kemp, School of Psychology, University of Tasmania

Student Investigator: Abbie Grace, School of Psychology, University of Tasmania

1. I have read and understood the 'Information Sheet' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves attending one 45-minute testing session during which I will be asked to fill in a questionnaire, complete two written text messaging tasks, provide some of my own recent text messages, and complete a short non-verbal reasoning task and a nonword reading task.
4. I understand that I might be asked back to attend one 30 minute testing session during which I will be asked to complete further literacy tasks.
5. I understand that participation does not involve any anticipated risks, but that if I become anxious or distressed as a result of participating, support and/or counselling will be provided to me at no cost.
6. I understand that all research data will be securely stored on the University of Tasmania premises for at least five years, and will be destroyed when no longer required.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that I will not be identifiable in any publications resulting from this study.
9. I understand that the researchers will maintain my identity confidentiality and that any information supplied to the researcher(s) will be used only for the purposes of the research.
10. I agree to participate in this investigation and understand that I may withdraw my permission at any time without prejudice.

Participant's name: _____

Participant's signature: _____ **Date:** _____

Statement by Investigator:

I have explained this project and the implications of participation to this volunteer OR he/she has read the information sheet and I believe that consent is informed and he/she understands the implications of participation.

Investigator's name: _____

Investigator's signature: _____ **Date:** _____

Text messaging questionnaire

Code: _____

Age: _____ years and _____ months

Sex: Male Female

Is English your first language? Yes No

If No: What is your first language? _____

Do you always send and receive messages in English?

Yes

No

If No: What percent of the time do you **send** _____% and **receive** _____% text messages in English?

What other languages do you text in? _____

1. How long have you owned a mobile phone? _____ months OR _____ years

2. How often do you usually send or receive text messages? On average, about:

Send: _____ messages per day **Receive:** _____ messages per day

3. What type of keypad does your phone have?

☐ Alpha-numeric keypad (with letters written above number keys like on a landline phone)☐ Qwerty keypad (like a computer keyboard)☐ Touch-screen keypad (with separate touch-screens for numbers/letters/symbols)☐ Other (please explain) _____

4. About what percent of the time do you use each of the following text entry systems? % of the time

Singlepress predictive (press each key once and phone predicts likely word) _____

Singlepress non-predictive (press each key once without needing/using prediction) _____

Multipress (press each number key 1 to 4 times for the right letter) _____

Other (please explain) _____

5. Which statement best describes the way that you **write** text messages? Tick one.**I use abbreviations and “text message” style spellings for...**☐ Most of the words that I write.☐ Only some of the words, such as “u” for “you”.☐ Nothing at all; I try to write all my words in conventional English.6. Which statement best describes the way you feel when you **read** text messages? Tick one.**When I read a text message that is full of abbreviations and “text message” spellings...**☐ I find it easy to work out what the sender meant.☐ I know the obvious abbreviations, but I sometimes struggle with the more obscure ones.☐ I find it difficult to work out many of the abbreviations.

7. How **appropriate** do you think it is to use text-message-style abbreviations in each of the following type of message?

(e.g., “u” for *you*, “lol” for *laughing out loud*, smiley faces)

	Not at all appropriate	Not really appropriate	It's okay	Reasonably appropriate	Entirely appropriate
Texting a friend	1	2	3	4	5
Texting a family member of your own age	1	2	3	4	5
Texting an older family member	1	2	3	4	5
Texting someone you don't know (e.g., to respond to a for-sale ad)	1	2	3	4	5
Emailing a friend	1	2	3	4	5
Emailing a family member of your own age	1	2	3	4	5
Emailing an older family member	1	2	3	4	5
Emailing a lecturer	1	2	3	4	5
Emailing someone you don't know (e.g., to respond to a for-sale ad)	1	2	3	4	5
Instant messaging/online chat to a friend	1	2	3	4	5
Instant messaging/online chat to a family member your own age	1	2	3	4	5
Instant messaging/online chat to an online company website (e.g., to arrange accommodation)	1	2	3	4	5
While taking lecture notes	1	2	3	4	5
In a handwritten exam	1	2	3	4	5
In a typed assignment	1	2	3	4	5

“How do u txt?”

While writing text messages, some people like to write their texts in “proper English”, some like to write “u” for *you* and “2” for *to*, and others like to use as many text-style abbreviations (“textisms”) as they can. We’re interested in how people use textisms in their everyday messages, and this study asks you to share examples of how you text through the following three texting exercises.

Please write clearly, so I can be sure about each word!

Texting exercise 1:

Please rewrite the following sentences as you would if you were going to send them as text messages. Please write the messages exactly as you would type them into your phone, with any abbreviations, emoticons etc., that you would normally use.

1 **Are you coming over today, honey? No problem if you can’t.**

Text:

2 **Happy birthday! See you tonight at seven o’clock. It’s going to be awesome!**

Text:

3 **Yes, love, let’s meet at Lazenby’s on Friday, 11.45am.**

Text:

4 **Do you want to get your Dad to pick us up, because Sarah can’t, okay?**

Text:

5 **By the way, did you get my text about tomorrow?**

Text:

Texting exercise 2:

Please write a message for each of the following scenarios as you would if you were going to each one as a text message. Please create the messages exactly as you would type them into your phone, with any abbreviations, emoticons etc., that you would normally use.

1

Write down what you would text to set up a meeting between you and your best friend somewhere in town on Saturday night.

Text:**2**

Write down what you would text your mum to ask her if she can pick something up from the supermarket for you on her way to your place.

Text:**3**

Write down what you would text a friend to tell them you are going to be five minutes late to meet them.

Text:**4**

Write down what you would text to congratulate your study partner on finishing a big essay and to ask them if they are going to attend a party that night.

Text:**5**

Write down what you would text someone you know from uni to find out whether or not they are going to go to a lecture this afternoon, and whether they can take notes on your behalf.

Text:

Texting exercise 3:

Please copy down the last 5 text messages you've sent, exactly as you typed them into your phone. Include more messages, if needed, to add up to at least 50 words overall. Please only choose messages that you feel comfortable sharing. If anyone's name is included, record them in this way: "Sam" = S____, "sam" = s____.

Make sure that you write out the messages exactly as they appear on your phone, including punctuation and emoticons.

Msg	Write/type your messages here, just as you wrote them on your phone	No. of words
1		
2		
3		
4		
5		
Number of words overall: (should be at least 50)		
If you haven't written 50 words in total yet, please write more messages until you have...		

Appendix B

Following is a copy of the ethics approval letters for each stage of these studies.

MEMORANDUM

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2764
Fax: (03) 6226 7148
Marilyn.Knott@utas.edu.au

**APPROVAL FOR AMENDMENT TO CURRENT PROJECT**

26 July 2010

Dr Nenagh Kemp
Psychology
Private Bag 30
Hobart

Ethics Reference: H10530

Text messaging and language skills

Dear Dr Kemp

The Chair of the Tasmania Social Sciences Human Research Ethics Committee approved the Amendment to the above project on 26/7/2010.

Amendment description:
Addition of PHD Student Abbie Grace & request to involve first year psychology students.
Full details as per amendment application form.

MHorder

Melanie Horder
Ethics Officer

MEMORANDUM

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2764
Fax: (03) 6226 7148
Marilyn.Knott@utas.edu.au

**APPROVAL FOR AMENDMENT TO CURRENT PROJECT**

17 August 2010

Dr Nenagh Kemp
Psychology
Private Bag 30
Hobart

Ethics Reference: H10530

Text messaging and language skills

Student: Abbie Grace

Dear Dr Kemp

The Chair of the Tasmania Social Sciences Human Research Ethics Committee approved the Amendment to the above project on 17/8/2010.

Amendment description:

1. Increase the minimum number of words for the naturalistic condition from 30 to 50 words, and the completion of further tests.
 2. Addition of questions to the approved text-messaging questionnaire.
 3. Results of the Nonword Reading Test will form the basis of the selection of students.
 4. Remove age limit and make the study open to university students of any age.
 5. Further permissions requested of students who have approved the use of their exam papers.
- Full details as per amendment application.

Yours sincerely

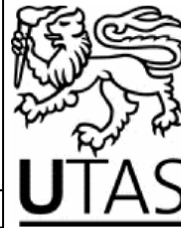
A handwritten signature in cursive script, appearing to read "M Horder", is placed above the printed name.

Melanie Horder
Ethics Officer

MEMORANDUM

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2764
Fax: (03) 6226 7148
Marilyn.Knott@utas.edu.au

**APPROVAL FOR AMENDMENT TO CURRENT PROJECT**

07 September 2010

Dr Nenagh Kemp
Psychology
Private Bag 30
Hobart

Ethics Reference: H0010530

Text messaging and language skills.

Students: Sarah DeJonge and Catherine Bushnell (Hons.)

Dear Dr Kemp

The Chair of the Tasmania Social Sciences Human Research Ethics Committee approved the Amendment to the above project on 3/9/2010.

Amendment description:

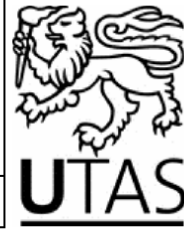
Permission sought to add a brief version of the Adult Reading History Questionnaire (sample supplied) developed by Rauno Parrila at University of Alberta, Canada. Full details as per ethics amendment application.

Yours sincerely

A handwritten signature in cursive script, appearing to read "MHorder", is written above the printed name.

Melanie Horder
Ethics Officer

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au



HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

22 August 2011

Dr Nenagh Kemp
School of Psychology
Private Bag 30
Hobart Tasmania

Dear Dr Kemp

Re: APPROVAL FOR AMENDMENT TO CURRENT PROJECT
Ethics Ref: **H0010530 - Text messaging and language skills**

Amendment to collect examples of students' sent text-messages for a third and final time in 2011, combined with administering the questionnaire.
Revised text messaging questionnaire.
Revised information sheet and consent form dated August 2011.

We are pleased to advise that the Chair of the Tasmania Social Sciences Human Research Ethics Committee approved the Amendment to the above project on 22 August 2011.

Yours sincerely

A handwritten signature in blue ink, appearing to be "K. Shaw", is positioned above the typed name of the sender.

Katherine Shaw
Acting Executive Officer

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au



HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

4 October 2012

Dr Nenagh Kemp
School of Psychology
Private Bag 30

Sent via email

Dear Dr Kemp

Re: APPROVAL FOR AMENDMENT TO CURRENT PROJECT
Ethics Ref: **H0010530 - Text messaging and language skills.**

- Addition of task: to ask participants to spell, to dictation in a passage, a number of everyday words which are often shortened or misspelled in text-messaging.
- Revised information sheet and consent form dated September 2012.
- Transcript of passages.

We are pleased to advise that the Chair of the Tasmania Social Sciences Human Research Ethics Committee approved the Amendment to the above project on 3 October 2012.

Yours sincerely

A handwritten signature in blue ink, appearing to be "KS", is placed above the typed name of the sender.

Katherine Shaw
Ethics Officer
Tasmania Social Sciences HREC

MEMORANDUM

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2764
Fax: (03) 6226 7148
Marilyn.Knott@utas.edu.au

**MINIMAL RISK ETHICS APPLICATION APPROVAL**

17 May 2010

Dr Nenagh Kemp
Psychology
Private Bag 30
Hobart

Ethics Reference: H11205

Examining text-message language intrusions into formal writing

Student: Abbie-Amanda Grace (PhD)

Dear Dr Kemp

Acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 16 May 2010.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

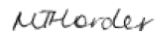
The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.
2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.
3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.
5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**
6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely



Melanie Horder
Ethics Officer